VOL. XVI. January, 1904. No. 1.

MUNICIPAL ENGINEERING

A MONTHLY MAGAZINE

DEVOTED TO THE IMPROVEMENT OF CITIES

PAVING, SEWERAGE, WATERWORKS, STREET LIGHTING, PARKS, STREET CLEANING, GARBAGE DISPOSAL, PUBLIC SANITATION, BRIDGES.

PUBLISHED BY
MUNICIPAL ENGINEERING COMPANY
INDIANAPOLIS AND NEW YORK.

Two Dollars Per Year. Single Copies, 25 Cents.

MUNICIPAL ENGINEERING

VOLUME XXVI JANUARY, NINETEEN HUNDRED FOUR NUMBER ONE

THE SEPTIC TANK FOR THE TREATMENT OF SEWAGE AT THE SOLDIERS' HOME NEAR SANTA MONICA, CAL.

By James D. Schuyler, Consulting Engineer, Los Angeles, Cal.

In the summer of 1899 the question of sewage disposal at the Soldiers' Home became a serious one because of complaints by neighboring farmers living to leeward, of the odors arising from the sewage irrigated fields. Threats of injunction and suits for damage caused action to be taken by the Board of Managers of the Home, and the writer was employed to report upon the situation. Strong pressure was brought to bear on the management to induce them to connect their sewers with the sewerage system of Santa Monica, and dump their sewage into the ocean, four miles distant. This would have cost $20,000 for the necessary pipes and $800 a year for use of the outfall. The sewage had always been used for irrigating the vegetable garden at the Home, and had added greatly to its fertility. The supply of other water for irrigation is scanty, and expensive to procure The sewage was needed, and its waste was manifestly improper and unwise. The writer recommended the construction of a septic tank for the liquefying of the solids of the sewage, and the continued use of the sewage for irrigation on the grounds of the Home. Later he was employed to prepare plans for the tank, his recommendation having been approved, and a contract was let for its construction on Nov. 7, 1900, at a total cost of $2,535.05.

The work was completed Jan. 30, 1901, and the tank was put in service March 18 following. The contractor carried out his obligations faithfully, but suffered a loss of nearly $500, chiefly due to a failure of one of the walls because of the lack of bracing of the forms. The contract included the laying of 475 feet of ten-inch vitrified pipe, for cleaning, or blowing out accumulations on the bottom of the tank, and 395 feet of twelve-inch vitrified inlet and discharge pipe.

The tank is 80 feet long, 20 feet wide, 10 feet deep, with a center wall, dividing it lengthwise into two compartments. These walls and the floor are of concrete. It is sunken entirely below the surface in an orchard of walnut trees and is covered with a roof of asphalt and gravel. It has been built in entire conformity with the plans, copy of which accompanies.

When the tank was first put in operation and during the last days of March the odor arising from the raw sewage in the tank was very offensive. This gradually decreased, and within a month or two became scarcely noticeable. Since then the operation of the tank has given entire satisfaction, and no complaints have been made. It has been cleaned out but once since it was put into service, and that was about a year after its use began. The writer was not present on this occasion, but the Chief Engineer of the Home stated that he found but a few inches of sandy or ashy sediment in the bottom.

The Home authorities are so well pleased with the action of the tank that they have made a requisition for another one for the treatment of the sewage from the Hospital, whose discharge was at too low an elevation to enter the present tank.

The only offensive odors which can now be detected arise from the ditches where the water is conveyed to the fields, and this is confined to a distance of a few hundred feet below the discharge end of the pipe. Sufficient attention is not always paid to the directions of the designing engineer to keep these ditches cleaned and change them occasionally, so as to allow of the cultivation and aeration of the soil of the bed of the ditches. The discharge of sewerage into the tank was carefully gauged in the

summer of 1901 by Samuel Storrow, C. E. of this city, the associate of the writer in the construction of the tank, by an automatic registering device, with the following result:

From 6 p. m. to 6 a. m. ...	27,297 gallons
From 6. a. m. to 6. p. m. ...	66,743 gallons
Total for 24 hours of	94,050 gallons

This was an increase of about 20,000 gallons daily over the gaugings made by the writer in May 1899. The volume of sewage has further increased in the past two years, as the population of the Home is steadily increasing, but no measurement has recently been made. It may now reach an average of 125,000 gallons daily, although this is merely an estimate.

Mr. Storrow also measured the flow from the hospital sewer for 68 hours, from July 26th to 29th, 1901, and found it fluctuating through such a wide range as to require a provision for handling 75,000 gallons daily, or an increase of 50 per cent over the maximum rate of discharge. Because of the desirability of destroying pathogenic germs existing in the hospital sewage, a special treatment has been recommended in addition to the septic tank for purifying the effluent by intermittent filtration.

The accompanying photographs illustrate the construction of the tank.

The tank has been inspected by many visitors, and its operation is universally conceded to be successful, and all that could be expected from a septic tank short of complete clarification and purification. The effluent has a cloudy, milky appearance, with flocculent black specks, carried in suspension.

Following are extracts from the specifications under which the construction of the septic tank was done.

The general size of the tank, inside measurement, is that of two parallel tanks, each ten feet wide by eighty feet long; nine feet deep at one end and nine and one-half feet deep at the other with a sand box at the deeper end. The tanks are built separated by a center wall but are built throughout as one piece of masonry, with certain entrance and discharge connections controlled by valves or gates. The whole is to be roofed with a gravel roof.

The contractor is to furnish all material excepting water, which will be delivered to him free at the nearest hydrant, and all labor, scaffolding, utensils and tools necessary to complete the brick work indicated on the plans, sections or specifications.

When there is cause to measure the brickwork it shall be counted by actual kiln count and not by measure.

All brickwork must be laid up with good hard-burned or the best mercantile bricks, acceptable to the engineer, laid in mortar with shove joints.

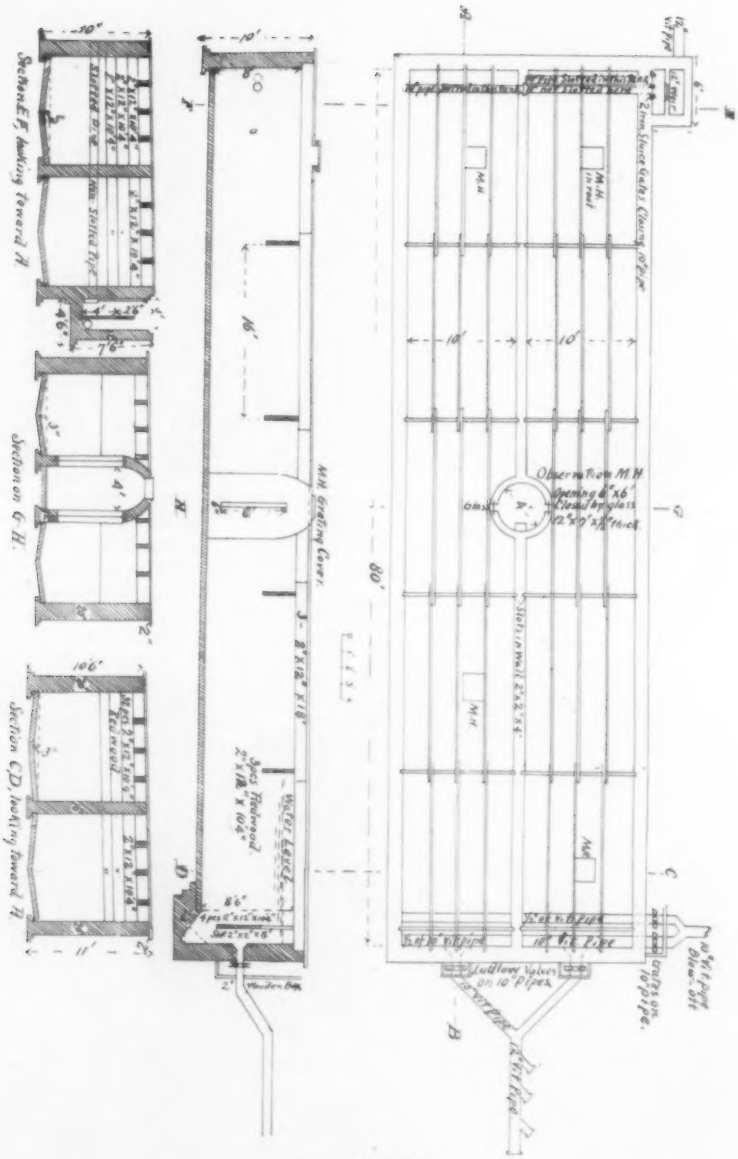
All bricks shall be well wet before laying. Each brick shall be laid with a shove joint in a full bed of cement, all the interstices being thoroughly filled. Every fourth course shall consist of a heading course of whole brick, extending through the entire thickness of the wall. All courses of brickwork shall be kept level and bonds shall be carefully preserved. When necessary to bring any course to the required hight, clipped courses shall be formed, as in no case shall any joints finish more than one-half inch thick. All brickwork shall be laid to the lines and all walls must be built firm, true, plumb, out of wind and square. Tops of walls must be carefully built up around the roof joints. All grooves in the masonry shall be filled up snugly around the cross partitions, which are to be put in place as the work progresses.

All brick work shall be laid in a mortar composed of one part by measure of fresh cement and 2½ parts by measure clean, sharp sand, properly screened, and mixed with sufficient water to render the mixture of proper consistency. Care must be taken to thoroughly mix the sand and cement dry in the proper proportions before adding the water. The mortar shall be mixed in small quantities only and in no case shall mortar that has commenced to set or stood over night be used.

The masonry work shall be erected by first excavating the material to the full cube of the completed structure, and then building the walls of the tank to their full hight, establishing these walls on a firm and well-set footing, as shown in the sections and drawings. After the cement in the walls has become well set and hard, the floor shall be laid with a grade of six inches from the sides to the center of each floor. The man-hole in the center of the tank shall be built upward with the partition wall and firmly bonded thereto. The glass windows in this manhole shall be well and carefully set so as to have a water-tight joint, and the glass shall be properly protected against injury.

All iron work shall be put in place and built in as the masonry work progresses.

After the masonry is thoroughly dry, all the inside walls and floor of the tanks and sand-box and discharge chamber



SEPTIC TANK

For the National Home for Disabled Volunteer Soldiers, Pacific Branch. Santa Monica, Cal.

shall receive a coating of California silicate compound, to be composed of 69 parts of clean sand, small enough to pass through a 20 mesh screen, and thirty parts of pure sulphur, and one-third part each of sal ammoniac, litharge and whiting, all to be melted and mixed together at a heat of not less than 550 degrees Farenheit; then allowed to cool, and then against brought to the melting point under a steady heat and held there by a constant fire. This preparation shall be applied to the walls with a brush in not less than two coats, and a third coat when necessary to bring the total thickness of the coating to not less than three-eighths of an inch, care being taken in heating and applying the material so that there shall be no blow-holes or bubbles in the finished work, and that the coatings shall be even and well brushed down.

The contractor is to set all iron work shown in the drawings or specified in such a way that it shall be firmly cemented into masonry, and the frame of the sluice gates in the discharge box shall be set in the masonry in such a way as to make a strong and water-tight connection. The 10-inch slotted discharge pipes shall be 10-inch cast-iron pipes one-half inch thick, with two holes, each one inch in diameter, bored in line and ten feet apart and with a slot mil ed through the pipe connecting these holes but not passing out the end of the pipe; when set in place these pipes shall have their bell ends imbedded in the masonry. The two ten-inch blow-off valves and the two ten-inch entrance valves shall be leaded onto a piece of ten-inch cast iron pipe, and this pipe shall be bedded in the masonry so as to make a strong and firm connection.

The weir in the discharge box shall be made up out of one-eighth-inch iron with a horizontal crest and vertical sides, projecting at least two inches clear of the masonry.

The 12-inch vitrified discharge and the 10-inch vitrified blowoff pipe shall be furnished and laid with cement joints in a trench excavated to the depth shown in the drawing and back-filled, all by the contractor, all on a uniform grade. The manhole shall be set with a cast-iron grating cover set in a cast-iron ring of standard sewer manhole pattern as used by the city of Los Angeles and approved by the engineer. The four 10-inch valves shall be set in two boxes made of two-inch redwood lumber with a cover set six inches above the ground.

The two iron sluice gates in the discharge chamber shall be of a good and substantial pattern, moving in a guide frame which shall be built into masonry. The slotted pipe shall be a ½-inch thick 10-inch cast-iron water-pipe, having a slot one inch wide by ten feet long milled out of two of the three sections of pipe and it shall be so set in the masonry that this slot shall come at the bottom and so that the bell ends shall be imbedded in the masonry. The roof-stringers shall be steadied by 2x4-inch cross-bracing cut in over the two center cross partitions and two square manholes shall be left in the roof near the discharge end fitted with tight wooden covers similar to skylight covers. The whole roof shall then be covered with a roofing paper, tar and gravel, or such an equivalent as shall be previously accepted by the engineer.

All concrete shall be mixed in the proportion of one of cement, three of clean sharp sand, and five parts of gravel, all measured, well screened and washed; the gravel to be of all sizes from pea size up to dimensions that will pass through a two-inch ring. The mixing shall be done on a tight platform and the materials shall be thoroughly mixed dry, before applying water. They shall be turned over by hand not less than three times dry, and three times after wetting. If the management accepts bids for concrete walls instead of brick all the walls must be molded true, plumb, out of wind, and of uniform thickness, and so thoroughly rammed as to leave no spaces or holes when the molds are removed. The concrete must be spread in layers of not more than six inches in thickness and evenly and thoroughly tamped so as to avoid bridging of materials over hollow spaces and so as to secure a perfect monolithic structure. If any portion of the wall has become set hard on the surface before completion, the surface shall be cleaned and coated with a wash of pure cement before the next layer is applied in order to secure a perfect bond. The work must be kept shaded from the sun and frequently moistened for ten days after setting. The concrete in the floor must be thoroughly tamped and troweled to a smooth and uniform surface at the one operation.

Cement—The contractor will be required to furnish the engineer with certified copies of the manufacturers' tests of each batch of ten barrels of the cement proposed to be furnished for the work and permit him to take such samples free of charge as he may desire for testing. All cement used shall conform to

Sidewalls and Manhole Completed. Forms for Middle Wall in Place.

Tank Completed Except Cover.

SEPTIC TANK, SOLDIERS' HOME, SANTA MONICA, CAL.

the requirements as to tensile strength and fineness, time of setting, etc., required in the specifications of the City of Los Angeles for the cement used in the Third-st. and Broadway tunnels, and be equal in every respect to the best cement manufactured by the Colton Cement Company. Any cement delivered at the site of the work which fails to meet these requirements and tests shall be removed at once from the premises and not used in any part of the work.

Gravel Roof—The roof is to be composed of spruce boards of good quality, surfaced on one side sufficiently to ensure a uniform thickness throughout and avoid any irregularity of top surface. The boards shall be closely laid and securely nailed to all the stringers and project a uniform distance of two inches beyond the walls all around. The boards are then to be covered with P. & B. mastic composition asphalt and gravel roofing, consisting of three layers of two-ply P. & B. waterproof felt smoothly spread upon the boards but not nailed thereto. Between each of the layers of the felt a heavy coating of hot refined asphalt will be spread with mops, and the top surface will be flooded with a hot coating of refined asphalt heavily mopped on. While still hot, there must be imbedded in this coating of asphalt a layer of forty-inch burlap, tightly stretched over the entire roof surface. The surface of the burlap thus prepared shall then be treated to two heavy coatings of refined asphaltum, to be poured on hot and spread evenly with mops; the first spreading of the mop to fill all the pores of the burlap and the second coating, to be put on immediately afterward, must entirely flood the surface, after which the whole surface of the roof shall receive an application of clean, dry, well screened gravel of pea size, swept on uniformly and evenly while the last asphalt coating is still hot, the gravel to be thoroughly dry and warm. The edges of the roofing shall be tacked to the edges of the boards, and trimmed to the outer edge, and a margin shall be formed with a strip of No. 18 galvanized iron bent to proper form, lapping two inches on top and one and one-half inches down the side, with a folded projection above to a level with the flush top of the finished roof. A neat, tight connection shall be made to all openings in the top of the roof. The contractor will be required to guarantee the water-tightness of the roof for a period of five years, giving an acceptable bond to perform all repairs needed within that period promptly on notification that the roof requires repair.

A tight connection shall be made all around between the roof and the walls, and all spaces so thoroughly filled with mortar as to make the tank practically air tight and prevent the leakage of gas

Backfilling—All the excavation outside of the tank, below the floor, and elsewhere, must be refilled with good material well tamped and wet down.

PORTLAND CEMENT MANUFACTURE.*

Burning the Mixture.

By Edwin C. Eckel, U. S. Geological Survey, Washington, D. C.

After the cement mixture has been carefully prepared, as described in preceding papers of this series, it must be burned with equal care. In the early history of the Portland cement industry various types of kilns were in use at different plants, patented continuous kilns of several styles being particularly favored in European mills, but, at present, practice in burning at the different American cement plants is rapidly approaching uniformity, though differences in materials, etc., will always prevent absolute uniformity from being reached. The kiln in which the material is burned is now almost invariably of the rotary type, the rotary process, which is essentially American in its development, being based upon the substitution of machines for hand labor wherever possible. A brief summary of the process will first be given, after which certain subjects of interest will be taken up in more detail.

Summary of Burning Process—As at present used the rotary kiln is a steel cylinder about six feet in diameter; its length, for dry materials, is usually sixty feet, while for wet mixtures an eighty foot or even longer kiln is frequently employed.

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This cylinder is set in a slightly inclined position, the inclination being approximately one-half inch to the foot. The kiln is lined, except near the upper end, with very resistant fire brick, to withstand both the high temperature to which its inner surface is subjected and also the destructive action of the molten clinker.

The cement mixture is fed in at the upper end of the kiln, while fuel which may be either powdered coal, oil or gas —is injected at its lower end. The kiln, which rests upon geared bearings, is slowly revolved about its axis. This revolution, in connection with the inclination at which the cylinder is set, gradually carries the cement mixture to the lower end of the kiln. In the course of this journey the intense heat generated by the burning fuel first drives off the water and carbon dioxide from the mixture and then causes the lime, silica, alumina and iron to combine chemically to form the partially fused mass known as "cement clinker." This clinker drops out of the lower end of the kiln, is cooled so as to prevent injury to the grinding machinery, and is then sent to the grinding mills.

Theoretical Fuel Requirements—As a preliminary to a discussion of actual practice in the matter of fuel, it will be of interest to determine the heat units and fuel theoretically required in the manufacture of Portland cement from a dry mixture of normal composition.

In burning such a mixture to a clinker, practically all of the heat consumed in the operation will be that required for the dissociation of the lime carbonate present into lime oxide and carbon dioxide. Driving off the water of combination that is chemically held by the clay or shale, and decomposing any calcium sulphate (gypsum) that may be present in the raw materials, will require a small additional amount of heat. The amount required for these purposes is not accurately known, however, but is probably so small that it will be more or less entirely offset by the heat which will be liberated during the combination of the lime with the silica and alumina. We may, therefore, without sensible error, regard the total heat theoretically required for the production of a barrel of Portland cement as being that which is necessary for the dissociation of 450 pounds of lime carbonate. With coal of a thermal value of 13,500 B. T. U., burned with only the air supply demanded by theory, this dissociation will require 25½ pounds of coal per barrel of cement, a fuel consumption of only 6.6 per cent.

Losses of Heat in Practice—In practice with the rotary kiln, however, there are a number of distinct sources of loss of heat, which result in a fuel consumption immensely greater than the theoretical requirements given above. The more important of these sources of loss are the following:

1. The kiln gases are discharged at a temperature much above that of the atmosphere, ranging from 300 F. to 2,000 F., according to the type of materials used and the length of the kiln.

2. The clinker is discharged at a temperature varying from 300 F. to 2,750 F., the range depending as before on materials and length of the kiln.

3. The air supply injected into the kiln is always greater, and usually very much greater, than that required for the perfect combustion of the fuel; and the available heating power of the fuel is thereby reduced.

4. Heat is lost by radiation from the ends and exposed surfaces of the kiln.

5. The mixture, in plants using a wet process, carries a high percentage of water, which must be driven off.

It is evident, therefore, that present-day working conditions serve to increase greatly the amount of fuel actually necessary for the production of a barrel of cement above that required by theory.

Actual Fuel Requirements and Output—Rotary kilns are nominally rated at a production of 200 barrels per day per kiln. Even on dry and easily clinkered materials and with good coal, however, such an output is rarely attained. Normally, a kiln working on a dry mixture will produce from 140 to 180 barrels of cement per day of twenty-four hours. In doing this, if good coal is used, its fuel consumption will commonly be from 120 to 140 pounds of coal per barrel of cement, though it may range as high as 160 pounds, and, on the other hand, has fallen as low as 90 pounds. An output of 160 barrels per day, with a coal consumption of 130 pounds per barrel, may therefore be considered as representing the results of fairly good practice on dry materials. In dealing with a wet mixture, which may carry anywhere from 30 to 70 per cent. of water, the results are more variable, though always worse than with dry materials. In working a sixty-foot kiln on a wet material, the output may range from 80 to 140 barrels per day, with a fuel consumption of from 150 to 230 pounds per barrel. Using a longer kiln, partly drying

the mix, and utilizing waste heat will, of course, improve these figures materially.

When oil is used for kiln fuel, it may be considered that one gallon of oil is equivalent in the kiln to about ten pounds of coal. The fuel consumption, using dry materials, will range between 11 and 14 gallons of oil per barrel of cement; but the output per day is always somewhat less with oil fuel than where coal is used.

Natural gas, in the kiln, may be compared with good Pennsylvania coal by allowing about 20,000 cubic feet of gas as equivalent to a ton of coal. This estimate is, however, based upon too little data to be as close as those above given for oil or coal.

Effect of Composition on Burning—The differences in composition between Portland cement mixtures are very slight if compared, for example, to the differences between various natural cement rocks. But even such slight differences as do exist exercise a very appreciable effect on the burning of the mixture. Other things being equal, any increase in the percentage of lime in the mixture will necessitate a higher temperature in order to get an equally sound cement. A mixture which will give a cement carrying 59 per cent. of lime, for example, will require much less through burning than would a mixture designed to give a cement with 64 per cent. of lime.

With equal lime percentages, the cement carrying high silica and low alumina and iron will require a higher temperature than if it were lower in silica and higher in alumina and iron. But, on the other hand, if the alumina and iron are carried too high, the clinker will ball up in the kiln, forming sticky and unmanageable masses.

Character of Kiln Coal—The fuel most commonly used in modern rotary kiln practice is bituminous coal, pulverized very finely. Coal for this purpose should be high in volatile matter, and as low in ash and sulphur as possible. Russell gives the following analyses of West Virginia and Pennsylvania coals used at present at various cement plants in Michigan.

—Analyses of Kiln Coals—

Fixed carbon	56.15	56.33	55.82	51.99
Volatile matter	35.41	35.26	39.37	39.52
Ash	6.36	7.06	3.81	6.13
Moisture	2.08	1.35	1.00	1.40
Sulphur	1.39	1.34	0.42	1.46

The coal as usually bought is either "slack" or "run of mine." In the latter case it is necessary to crush the lumps before proceeding further with the preparation of the coal, but with slack this preliminary crushing is not necessary, and the material can go directly to the dryer.

Drying Coal—Coal as bought may carry as high as 15 per cent. of water in winter or wet season. Usually it will run from 3 to 8 per cent. To secure good results from the crushing machinery it is necessary that this water should be driven off. For coal drying, as for the drying of raw materials, the rotary dryer seems best adapted to American conditions. It should be said, however, that in drying coal it is usually considered inadvisable to allow the products of combustion to pass through the cylinder in which the coal is being dried. This restriction serves to decrease slightly the possible economy of the dryer, but an evaporation of 6 to 8 pounds of water per pound of fuel coal can still be counted on with any good dryer. The fuel cost of drying coal containing 8 per cent. of moisture, allowing $2 per ton for the coal used as fuel, will therefore be about 3 to 4 cents per ton of dried product.

Pulverizing Coal—Though apparently brittle enough when in large lumps, coal is a difficult material to pulverize finely. For cement kiln use, the fineness of reduction is very variable. The finer the coal is pulverized, the better results will be obtained from it in the kiln; and the poorer the quality of the coal, the finer it is necessary to pulverize it. The fineness attained in practice may therefore vary from 85 per cent. through a 100 mesh sieve, to 95 per cent. or more through the same. At one plant a very poor but cheap coal is pulverized to pass 98 per cent. through a 100 mesh sieve, and in consequence gives very good results in the kiln.

Coal pulverizing is usually carried on in two stages, the material being first crushed to 20 to 30 mesh in a Williams mill or ball mill, and finally reduced in a tube mill. At many plants, however, the entire reduction takes pace in one stage, Griffin or Huntingdon mills being used.

Total Cost of Coal Preparation—The total cost of crushing (if necessary), drying and pulverizing coal, and of conveying and feeding the product to the kiln, together with fair allowances for replacements and repairs, and for interest on the plant, will probably range from about 20 cents to 30 cents per ton of dried coal, for a four-kiln plant. This will be equivalent to a cost of from 3 to 5 cents per barrel of cement. While this may seem a heavy addition to the cost

PROSPECT HILL PARKWAY, SOMERVILLE, MASS.

PROSPECT HILL PARK DRIVE, SOMERVILLE, MASS.

of cement manufacture, it should be remembered that careful drying and fine pulverizing enable the manufacturer to use much poorer—and therefore cheaper—grades of coal than could otherwise be utilized.

CRITICISMS OF ASPHALT PAVING ESTIMATES AT DETROIT, MICH.

By W. F. Raymond, Indianapolis, Ind.

On page 435 of the December issue of Municipal Engineering, under the heading of "Asphalt Paving Estimates in Detroit," there is given the synopsis of a report by Mr. C. A. Proctor to the Council Committee on streets for the city of Detroit, Mich., under date of Nov. 17 last.

There is much of value in the report, much worthy of commendation, but from the synopsis it is very inaccurate and incomplete and very misleading. Following the items as reported, take first

Plant and Maintenance—Primarily the appropriation of $10,000 for installation of a plant capable of such capacity as figured upon is insufficient to meet the requirements of modern improved and constantly improving methods in plant construction and devices; $12,500 to $15,000 would undoubtedly be needed.

Secondly, but one roller is figured on at a less cost than $2,500. What becomes of surface rolling on new and re-surface work? And if done by hand-rollers what allowance has been made for the extra men required on the street to manipulate the hand-roller?

Modern methods and those conceded best do not admit of surface rolling with a hand roller, but require one of at least 2½ tons (steam); this, therefore, would mean an additional outlay for a second steam roller. Another point is that one roller cannot properly do surface and finish work for 1,500 square yards of paving in a day, hence another necessity for two rollers. The other figures for cost of plant submitted in the report are quite fair, though from the above it will be seen that interest and maintenance cost must be brought higher because a greater principal is required.

Cost of Binder and Labor—In binder items the report shows plant labor costs in excess of that of street labor. This should accurately apply to new work alone. Where binder is used for repairs the cost of labor on the street exceeds by far the labor cost at the plant. To best show the accuracy of this statement lists and prices per diem of superintendence and labor required are given, first, for the plant (new work and repairs;) second, for street labor, using binder and top, both on new work and repairs; these figures are based on some years experience with work under normal average economical conditions.

PLANT LABOR—NEW WORK—BINDER OR TOP.

1	Foreman	$ 4.00
1	Engineer	3.50
1	Assistant Engineer	2.50
1	Mixerman	2.00
1	Dust Man	1.75
2	Drum Firemen	3.50
1	Tank Man	1.75
1	Utility Man	1.75
1	Office Boy	1.00
1	Water Boy	.75
1	Watchman	1.50
10	Laborers	15.00
	Total	$39.00

PLANT LABOR—REPAIR WORK.

1	Foreman	$ 4.00
2	Engineers	3.50
1	Assistant Engineer	2.50
1	Mixer Man	2.00
1	Utility Man	1.75
2	Firemen	3.50
1	Dust Man	1.75
1	Tank Man	1.75
1	Office Boy	1.00
1	Water Boy	.75
1	Watchman	1.50
6	Laborers	9.00
	Total	$33.00

STREET LABOR—BINDER—NEW WORK.

1	Foreman	$ 4.00
1	Timekeeper	2.00
1	Engineer	3.50
1	Helper	1.50
3	Rakers	6.75
2	Tampers	4.00
1	Joint Painter	1.50
2	Wagon Dumpers	3.50
1	Utility Man	1.75
*5	shovelers	8.75
1	Watchman	1.50
	Total	$38.75

* Smoothers are usually used as shovelers on binder, which would bring the cost for two 50 cents a day more, making total $29.25.

STONE AVENUE EXTENSION, SOMERVILLE, MASS.

MONROE STREET, SOMERVILLE, MASS.
Final Rolling of Macadam in Progress.

STREET LABOR—TOP—NEW WORK.

1	Foreman	$ 4.00
1	Timekeeper	2.00
1	Engineer	3.50
1	Engineer	3.00
3	Rakers	6.75
(a) 2	Tampers	4.00
2	Smoothers	4.00
1	Painter	1.50
(b) 1	Utility Man	1.75
2	Wagon Dumpers	3.50
4	Shovelers	7.00
1	Watchman	1.50
	Total	$42.50

(a) In case of work between street car rails two more tampers and one more shoveler would be needed making cost $5.75 a day more or a total of $48.25.

(b) Used chiefly as cement sweeper.

In figuring for binder and top for repairs and cut holes, the distribution of charges cannot be much more fairly made than by assigning one-third to binder and two-thirds to top. For this reason but one list for labor required is given, and the cost may be distributed accordingly. The holes must be made ready, the dirt and old material cleaned up, so a truly accurate distribution of binder cost and top cost is next to impossible. The labor needed on asphalt repairs, whether laid with or without binder, follows:

STREET LABOR—REPAIRS.

1	Foreman	$4.00
1	Timekeeper	2.00
(1) 2	Engineers	6.50
(2) 3	Tampers	6.00
2	Smoothers	4.00
1	Joint Painter	1.50
1	Water-boy	1.00
3	Shovelers	5.25
1	Utility man (sweeper)	1.75
2	Men cleaning up	3.00
3	Joint Cutters	5.25
3	Men breaking out	4.50
1	Man cleaning out holes	1.50
1	Watchman	1.50
(3) 2	Teams cleaning up	7.00
	Total	$54.75

(1) On patches over four or five feet square surface rolling is necessary. Two rollers should therefore be used.

(2) Oftentimes where the patches are many and small four tampers are necessary to keep up with the rakers.

(3) If haul to dump is at all long, two teams will be needed to clean up, though sometimes one will do, if on the last turn at night the teams hauling material from the plant are required to take a load of dirt from the street.

Again on repair work, whether laid with or without binder, a daily average of 700 square yards for each working day is high, with the forces and prices above listed both for plant and street; a more nearly accurate daily average of yardage, especially where binder is used, would be from 400 to 500 square yards. Let us see what this would mean in cost, including material, plant and street labor, with maintenance and repairs left out. The following table is based on 500 square yards of paving laid in one ten-hour day, three-inch wearing surface, one-inch binder, two-inch top.

TOTAL REPAIR COST.

Street pay-roll	$ 74 75
Plant pay-roll	33 00
46 boxes binder	99 84
84 boxes top	318 22
Coal and fuel (plant)	30 00
Coal and fuel (street)	4 50
Hauling, five teams at $4.50	22 50
Total	$562 81
Cost per yard	$1 12

Between these figures and those of Mr. Proctor at 67c a square yard, on 500 square yards of repair work, including asphalt and binder, there is a difference of $167.81 on a very good day's work. Some consideration must be given, however, to the fact that in these estimates Mr. Proctor's figures for fuel, for stone, for teams and asphalt have been given, the remaining items being figured from prices ruling in Indiana, and more especially Indianapolis.

In the estimate of forty-six boxes of binder the amount of asphalt cement required was figured at a minimum, and very clear lime stone would be necessary to keep within this estimate. In the eighty-six boxes of top allowance was made for each ten-foot box of surface mixture to lay practically six (6) square yards of pavement; in binder each ten-foot box to lay a little more than ten (10) square yards, though it should run eleven or a little more, especially in repairs at one-inch thickness. Further, in the asphalt charges the stone dust allowance was liberal, but not too great by many cents, dependent greatly on freight rates and whether ground at the plant of the user or received ready for use.

Now as to new work, if 1,500 square yards of two-inch asphalt was laid in a day the total plant and street labor plus the cost of materials, but less the cost of hauling, maintenance, repairs, etc., would be as per the above tables, $955.10, or a cost of more than sixty-three cents a square yard for top alone. If but one and one-half-inch asphalt was laid (no binder), the cost should be practically one-fourth less, or $716.33, or forty-one cents a square yard. The last is low

HANCOCK STREET, SOMERVILLE, MASS.
Before Improvement.

HANCOCK STREET, SOMERVILLE, MASS.
Macadam Improvement Completed.

as the discount could apply only to materials.

The estimates for new work by Mr. Proctor are quite too low for another reason, since he makes no allowance for stormy days, for days or even hours when the plant or one of the rollers breaks down and he must pay many of his men full or at least half time in order to retain the class of skilled labor which the proper laying of asphalt demands.

Data and figures covering many pages could be written on this subject, showing cost prices under varying conditions, but it must ever be borne in mind that vast differences exist between new and repair work; also, that the use of binder on any work makes a vast difference in cost, thickness of the asphalt surface, too, being all important in figuring. Were it possible to lay 1,500 square yards of 2 in. top six days a week, and every week from April to November, then one could say that 67c a square yard was a good price for municipalities, but taking all things into consideration a contractor should hesitate a long time before he signed a contract for any kind of asphalt work for less than $1 per square yard.

Theoretically, 67c per sq. yard is very attractive to the municipality in quest of good streets at the lowest possible cost; practically, over $1 per sq. yard would be found to be the nearest approximate average cost. Should a municipality have thousands of yards of new work to lay and many of repairs no doubt it could save money by doing its own work, cost of plant not considered, for on days and in seasons when new work should not be done for satisfactory results many repairs could properly be made. The idea is a good one and should be tried, but only after most thorough investigation, and under the direct management of a hustling, competent man of long and successful experience.

THE STREETS OF SOMERVILLE, MASS.

The pictures in the reports of Mr. John P. Prichard, who is Street Commissioner and a member of the Board of Public Works of Somerville, Mass., show the quality of the work done under his department even better than the text. All the work is done by day labor and nearly all the street construction is macadam. The pictures show the road rollers, of which the city has one fifteen-ton, one twelve-ton and a five-ton asphalt roller. The streets reconstructed in 1902, three-fourths of them wholly, measured 26,788 feet in length and the total cost was $21,338.53.

JOHN P. PRICHARD,
Street Commissioner, Somerville, Mass.

Two of the pictures show the brown-tail moth and the process of removing it from the trees. The street commissioner is waging vigorous war against the pest, and says the city is not yet free. The work of removal cost $6,092.07 in 1902. With these explanations and the titles under the pictures they will speak for themselves.

REMOVING BROWN TAIL MOTHS, SOMERVILLE, MASS.

EDITORIAL COMMENT

Cost of Municipal Laying of Asphalt.

The Transportation Question in the Cement Trade.

Has He Gone to New York.

COST OF MUNICIPAL LAYING OF ASPHALT.

In the December number of Municipal Engineering, page 435, was an estimate by Mr. Proctor of the cost of laying asphalt in a municipal plant, which computed the actual cost of laying asphalt at 67 cents, including three items, topping at 44 cents, binder at 20 cents and maintenance at 3 cents. The maintenance charge is for maintenance of plant, not of pavement, and includes interest, depreciation, repairs and insurance, rent, and taxes.

Mr. Raymond, in an article elsewhere in this number, points out the fact that these estimates assume constant employment, or, rather, no expense for plant or labor when work is not in progress, and justly claims that this asumption is without sufficient basis.

In the November number of Municipal Engineering will be found some figures from the municipal asphalt plant at Winnipeg, Manitoba, which clearly show the difference between cost with this assumption and under everyday working conditions. The figures for cost of materials are larger than those given by either Mr. Proctor or Mr. Raymond, and the final assessments against property owners show how much they must be increased that the city may come out even.

Mr. Proctor thinks 67 cents is enough to allow for cost of laying binder and top, as stated above. Mr. Raymond thinks this might be all right for constant work, but that the actual cost with due allowance for lost time and labor and without allowance for profit would be more than $1. The authorities at Winnipeg, in computing the assessments to be made against property owners for asphalt pavements laid assign to the items included in the figures of the two gentlemen, named the following cost prices:

Binder, 1½ inches, at plant	.18½
Binder labor on street	.08
Surface, 1¾ inches, at plant	.45
Surface labor on street, teaming, etc.	.15
Plant charges	.05
Other charges	.03
Making a total of	.94½

The charge for labor is undoubtedly very high for continuous work, and shows the great allowance that must be made for lost time.

It is evident from these figures that Mr. Raymond's plea for careful investigation and for full consideration of all the circumstances has a good basis. Detroit has been paying from $1.12 to $1.23 for surface repairs, according to Mr. Proctor, and he estimates that, with a cost of 67 cents in a municipal plant the city would save over $50,000 a year with the amount of work done the past year. Evidently, were the asphalt laying the straight work of laying new pavement which was done in Winnipeg, the cost will be nearly 50 per cent. more and the saving consequently nearly cut in two. This cuts down the profit which the contractor is making under present conditions very materially. But, as Mr. Raymond points out, the cost of repairing is much greater than the cost of laying new pavement, so far as the labor item is concerned, at least. This is evident from a consideration of the facts that the patch must be cleaned out, the old material removed, a good surface for junction with the new material formed and a tar coat applied, all in addition to anything required in laying new pavement; also that the patches are more or less scattered, and there is loss of time in moving men and machinery from one patch to another and in unloading material. The labor on the street, according to the Winnipeg experience, costs 23 cents a square yard. An increase in labor cost of 50 per cent. is perhaps not excessive, which would increase the total cost of laying repairs per square yard by 11½ cents, making it $1.06. With Detroit prices this leaves only 6 to 17 cents a yard, or 5½ to 16 per cent. for the contractors' contingent fund and his profits. This does not seem to be exorbitant.

A report of the New York Commissioner of Public Works made in November, 1903, on the subject of a repair plant for asphalt pavements for the Borough of Manhattan contains an estimate by Dr. J. C. Bayles of the cost of repair materials and labor as follows per square yard of pavement:

Asphalt cement	.30
Sand, stone, oil, etc.	.15
Mixing, carting and laying	.35
Total	.80

The items do not agree very closely with those in either Winnipeg or Detroit or as given by Mr. Raymond, partly because the form of the pavement is different, but, when plant charges and general supervision are added, the total will approximate that given for Winnipeg. The present contract rates for repairs in Manhattan are for binder, $1.52, and for wearing surface, 45 cents a square yard.

The contractor may have one advantage over the city in being able to obtain asphalt at a lower price than that paid by Winnipeg, but this is a question quite aside from that under consideration and does not change the fact that the city must pay the prices named.

Facts are sometimes hard things for theories to overcome, and it is not safe for a city to enter the asphalt paving and repair field without more careful consideration of all the conditions than seems to be shown in the Detroit report under discussion.

Such portable apparatus as is now offered for small repairs of asphalt streets and for putting them in shape before the actual time for repair arrives, do not come properly into this consideration, as they have their own place, and can often be used profitably by city or contractor when there is a regular contract for repairs of the customary nature, making certain classes of repair more economically than they can be done with the ordinary asphalt plant.

THE TRANSPORTATION QUESTION IN THE CEMENT TRADE.

The third edition of the "Directory of American Cement Industries" is now in active preparation for issue early in 1904. It shows a vast increase in capacity for production of cement during the year, and an almost equal increase in consumption. The demand would, apparently, have exceeded the supply throughout the year as it did early in the season, if strikes and financial flurries, especially the former, had not curtailed building operations.

The cement factories are now so widely distributed that the question of freight rates is becoming one of great importance. This condition was recognized three years ago or so by some of the larger companies, and their extensions to keep up with their rapidly growing trade have been made in the form of new mills located in new regions. Factories of Pennsylvania companies are now located in Ohio, Indiana and Missouri, as well as in the home state, and there is at least one group of capitalists who are establishing works in various parts of the United States and Canada, independent in form, but under the same financial control.

A controlling reason for this tendency is found in such facts as the following: Some bids for work were called for and cement prices clustered about $2.05 to $2.10. One contractor proposed to a nearby factory to purchase at the factory for the same price that he was offered for equally good cement at a distant factory. For illustration we will take the freight rate from the Lehigh region to Cincinnati, 15 cents a hundred pounds, and from Michigan points, 7 cents. The difference, about 30 cents a barrel, is a very satisfactory increase of the contractor's profits. When cement stocks are large and money is wanted by the manufacturers, contractors can pick up numerous bargains of this sort.

Cement has been quoted in New York at about 90 cents in large lots, and there has been nearly the same condition in Chicago when there was any large business to do. But in San Francisco cement in car load lots will bring about $1.75. An exaggerated case is found in the bids for cement for the Touto basin dam in Arizona, where the price of cement was $9 a barrel, due largely to the long railroad and wagon haul. This is an exceptional case and the government engineers have determined that a large sum of money can be saved by building a Portland cement plant on the ground for the sole purpose of making the cement for this structure. As shown more in detail in another department of this number of Municipal Engineering, bids will now be asked for cement delivered on the ground and for cement made on the spot by the machinery already purchased.

Though an exaggerated case, this demonstrates the theory that the location of new cement plants must be based largely on the matter of freight rates, assuming a local demand, actual or prospective, and proper materials.

The enormous fluctuations in price of cement recently are due largely to the inability of the mills to supply the legitimate demand for cement, as detailed in this department in the November number, but when temporary checks to building operations fill up the stock

houses, the anomalies of freight charges and the resulting competition of local factories with over-loaded factories in other districts exaggerate the variations and result in such peculiar conditions as a factory shipping all the cement it can make at a price which would indicate a complete stagnation of the trade.

While it is necessary to shut down factories for repairs, any long continued stoppage of all factories would put them next season in the same condition they were the past season, unable to fill orders and helping to bring on a stagnation in business by restricting building operations or necessitating substitution of other materials. When the cement plants are able to fill the regular demand, and are better distributed, cement rates will reach a state of comparative uniformity, if not artificially manipulated, but in the meantime, such pronounced action as seems to be contemplated by the large manufacturers, as detailed elsewhere, will only exaggerate the unfortunate conditions under which we are laboring in the present stage of development of the industry.

That many persons have confidence in the reality of a demand for cement next season in excess of the supply, especially if the mills are shut down for a large part of the winter, is indicated by the fact that money is being borrowed with which to invest in cement at present prices, with the expectation of making large profits next season, notwithstanding extra freight and storage charges.

A comparison of capacity and demand will be attempted in an early number of this magazine based on the data gathered for the new edition of the "Directory of American Cement Industries."

HAS HE GONE TO NEW YORK?

Our readers of some years' standing may remember the methods of certain journals in Louisville and later in Cincinnati in working up their circulation. They purported to be industrial papers circulating in the South and asked for approval of laudatory articles concerning men or machinery, and proposed to sell copies of the number containing the notice.

A notice recently received by a reader of this magazine from the "Financial Review" of New York City suggests the possibility that the same writer has removed to that city. The notice is as follows:

For those who are interested in the matter of municipal reform, in the beautifying of our large cities from an artistic standpoint and, in fact, the promotion of better government in all departments, parks included, the recent convention of the American Society of Municipal Improvement, which was held in Indianapolis, will no doubt have an interest, for this association has proved useful in the past and has a bright future. The election of Mr. —— of ——— as ——— has been commented upon from different standpoints naturally enough, but in no case has the comment been of an unfavorable character. His own work in an official way has been not only competent but has afforded evidence that he is heart and soul in favor of anything calculated to promote improvement in his own city. Mr. —— has a host of friends both in and outside of the organization referred to and in —— so his election was logical. As a man of affairs, also, he stands high in the business world.

A slip in the name of the city shows that the notice is sent to all the officers of the society in the same wording. There must be a monotony in the columns of the paper which would discourage the placing of a $5 subscription, if a sample copy could be seen before making the reply which the following letter, accompanying the notice, is intended to bring:

We inclose an item which, with your permission, will appear in our next issue. We would like to receive your subscription, in which event we would send you twenty copies gratis. Trusting we shall hear from you we remain.

THE QUESTION DEPARTMENT

PLASTERING ON HOLLOW CONCRETE BLOCKS.

I have a house nearly finished with hollow concrete blocks. It is a good looking house and many admire it. I would like to know if we can plaster on the blocks or will it be better to lath against the blocks. Some think the blocks will sweat and color the paper.

R. B. CLEMENT,
Walkerton, Ont.

One of the points made by the advocates of hollow cement block construction is that the plastering for the inside of the house can be applied directly to the blocks without any studding and lath. The hollow wall is expected to keep the inside surface dry and warm. The joints must be well filled and the proper junctions made according to the designs of the blocks. Most of the blocks break the joints so that moisture will find it very difficult to follow them through to the inner wall surface, and some go so far as to put joints only half way through the wall, the blocks being made so as to overlap. Any of the methods in common use promise success in keeping the inner wall surface dry.

The blocks should be thoroughly set and dried before the plaster is put on, otherwise there might be a slight absorption by the plaster of any free water used in the construction or absorbed from exposure, with a consequent discoloration. This can be entirely prevented by proper curing of the blocks and drying of the walls before plastering.

ABOUT CEMENT SIDEWALKS.

Do you know of a good form for specifications to lay cement sidewalks? Can you give me approximate cost per square yard to lay cement walk, grading done by owner? Can you give me any other facts as to cement sidewalks?

J. DICKINSON CONDICT,
Madison, N. J.

The "Handbook for Cement Users" ($3) contains examples of the best specifications for cement walks, from which one can be selected which will suit the local conditions. The chapter on data for estimates will give information from which the cost of walks can be ascertained when the cost of local materials is known. Walks may cost from, say 10 cents per square foot to 20 cents or so, according to specifications, cost of cement, kind and cost of other materials, labor conditions, difficulty of work, etc.

CEMENT CHEMISTS AND ENGINEERS.

I have some rock which I would like to have analyzed for cement and would like to be referred to some one who can do the work. Please also refer me to some one as to the cost of a cement plant and cement machinery.

One rock is a black porous lava, of which there is a large solid body on the railroad, with side tracks, water and fuel accessible. It is being used for concrete, fire-proofing and some kinds of ornamental work. Tests have been made on it for slag cement with favorable results. Another rock is a gray volcanic tufa, also on the railroad, with water and fuel.

G. R., Los Angeles, Cal.

Who can furnish estimates on cement plants?

W. C. B., Toronto, Ont.

Reference should be made to the "Business Directory" in the advertising department of Municipal Engineering, under the heading of "Cement Plant Designers;" also to the list of "Engineers Who Design Cement Plants" in the "Directory of American Cement Industries" ($5).

With reference to the first questions it might be said that similar materials have been used with fair success since the days of the ancient Romans, and are now in use at San Giovanni a Teduccio, near Naples, Italy. The questions of quality of product, cheapness of freight on raw materials and supplies and proximity and size of market for the cement are matters which must be specially considered, even if the chemists' reports concerning the value of the material are favorable. Uniformity in composition of the raw materials and proximity of any corrective material which may be necessary to produce the best cement are also essential features in such a proposition, especially since the well established custom of using the present widely-distributed raw materials must be overcome, and the wide distribution of cement factories makes competition keen in all parts of the country which have any market for cement worth going after.

PLANS FOR CONCRETE CULVERTS—WHERE TO PURCHASE STEEL BEAMS.

1. Where can we get plans and specifications for concrete culverts and bridges?

2. Where can we get iron and steel I-beams by the carload?

K. & CO., Tecumseh, Neb.

The best place to get specifications for concrete culverts and bridges is in the "Handbook for Cement Users" ($3). Valuable information will also be found in the back numbers of Municipal Engineering. Plans should be prepared by an engineer of experience in this class of work who can have an opportunity to make himself familiar with the local conditions which must be met, such as span, foundation, protection from flood, possibility of settlement, possible loadings, etc. Reference may be made to the "Business Directory" in our advertising pages under the headings "Civil Engineers" and "Bridges." Lists of names of Engineers using concrete will also be found in the "Directory of American Cement Industries" ($5).

2. The nearest manufacturer of structural steel is probably the Colorado Fuel and Iron Company, Denver, Colo. Other makers are the Cambria Steel Company, Chicago office, 138 Jackson Boulevard; Carnegie Steel Company, Chicago office 204 Dearborn-st.; Illinois Steel Company, The Rookery, Chicago.

CEMENT REQUIRED FOR WET CONCRETE.

Being an appreciative subscriber of your magazine I would be pleased to have you answer the following question, as from the data at hand I cannot figure it out. We are now making what is called dry concrete and tamping it, and the molds that we are using make it rather difficult to tamp without expending much time. We do not care about the outside finish, i. e., we do not care whether it looks like cut stone or not. We are using one part Portland cement, two parts sand and four and one-half parts gravel passing a three-fourth-inch screen and the sand screened from it. What we want to know is how much more cement we will have to add to have practically the same strength concrete by the wet concrete process, i. e., wet enough so we can pour it into the mold.

F. A. SICKLESTEEL,
North Branch, Mich.

The claim made for wet concrete is that it produces a stone of greater strength with the same proportion of cement. If the mixture is properly made this is probably true, since the stone will be somewhat more dense. The mortar must not be so wet that the heavier stones will settle to the bottom and the water will collect on the top, and still it must be wet enough so that the mixture will flow into all corners and recesses of the mold and leave no vacancies bridged over by the stones wedging together. The mixture must be thoroughly well made before and after the water is added so that the cement will be uniformly distributed through the mass, and in such manner that the water will not wash it out. With care a stronger mixture will result than when the concrete is made with as little water as possible and tamped in the ordinary way, though thoroughly tamped stone is shown by some experiments to be equal if not slightly superior in strength.

It must be remembered that the wet concrete must be left in the molds for several days, two or more, to set, while the dry tamped concrete can be removed immediately if properly handled.

HOW TO MAKE LIGHT-COLORED CEMENT WALKS.

I would like to know what method is adopted to obtain light-colored walks. Is there any process by which cement walks can be bleached out white after the troweling and floating is done?

J. H. OTTERSTATTER,
Titusville, Pa.

Each cement has a fairly definite color which cannot be changed. This color does not appear always when the surface is first finished and will usually be somewhat lighter after the cement has fully set and the surplus water has evaporated.

Walks can be whitened in color by using white materials in finishing. The use of marble dust is described in Municipal Engineering, vol. xxv., pp. 250 and 419, the latter article giving specifications for sidewalk construction.

Most persons desire darker walks rather than lighter, but the use of marble or limestone dust of light color will make the color as light as it can be made.

There are no successful processes for whitening cement work after it has been laid.

PATENTS ON HOLLOW CONCRETE BLOCKS.

Can you inform me as to whether there is any patent now pending or in force upon the manufacture of hollow concrete blocks for building or upon the manufacture of the molds?

F. A. V., Ellsworth, Kas.

The subject of patents on hollow concrete blocks was quite fully discussed

in Municipal Engineering, vol. xxiv, p. 436, and a list of the earlier patents on blocks of various forms and for various purposes is there given.

There are also a number of patents on machines for making the blocks.

Among the articles in Municipal Engineering describing blocks, machines for making them and processes, the following may be mentioned, some of them containing references to the patents covering the apparatus, process or product:

"Concrete Building Blocks," vol. xxii, pp. 13, 161, 163. xxiii, p. 392.

"H. S. Palmer's Method of Concrete Building," vol. xxiii, p. 482.

"Machines and Methods for Making Hollow Building Blocks," vol. xxiv, p. 191, describing the machines and processes patented by H. S. Palmer, N. F. Palmer, the Cement Machinery Company (Normandin), Seamans, Stevens, and the Standard Stone Company.

The Seamans machine is described in vol. xxiv. pp. 234, 393, and vol. xxv, p. 375, with patent specifications.

Some information regarding suits on patents will be found in vol. xxiv, p. 393, 453.

The blocks of the American Hydraulic Stone Company are described in vol. xxiv, p. 457.

The Miracle pressed concrete block machine is described in vol. xxv., p. 53.

The Normandin machine is described in vol. xxv, p. 54.

The Winget machine and block are described in vol. xxv, pp. 129, 390.

Dykema's molds and their product are described in vol. xxv, p. 464.

Reference may be made also to our advertising columns, as the prominent makers of machines and blocks are represented there. Fisher's hydraulic stone system is one of the latest.

New patents are issued at frequent intervals and if watch is kept on the list of "Recent Inventions" in the department of "Machinery and Trade," in Municipal Engineering each month, the general character of these patents and their numbers and claimants can be learned.

SILEXOID PORTLAND CEMENT.

Can you tell me what is Silexoid Portland cement, which is on the market, and who makes it?

J. D., Kankakee, Ill.

The Silexoid Portland Cement Company is a corporation whose main office is at Union City, Mich. It succeeds the Calumet Portland Cement Company and has its works at Thirty-ninth-st. and Lowe-ave., Chicago, Ill., where it makes its "Improved Portland" cement by grinding up together Portland cement and crushed limestone exceedingly fine. It is thus similar to silica Portland cement, which shows excellent qualities, substituting, however, limestone for sand in the mixture. Tests of the cement are not at hand, but it is probable that they show high results, especially when the cement is tested neat. Neither is any information at hand regarding its durability in various kinds of construction.

CONCRETE FLOOR FOR ENGINE HOUSE.

We would like to know if a board floor two inches thick could be covered with expanded metal or wire netting and a coating of cement two inches thick, made of 2 parts sand and 1 part cement, placed on this metal would make a good job. Would it be sufficiently strong for a floor in a fire engine house which is not used a great deal? We presume that the floor is solid to start with.

ILIFF BROTHERS. Cedarville, O.

This question cannot be answered definitely without a personal knowledge of the present floor and its supports, but it is almost certain that the present floor is not strong enough to carry the weight of the cement floor in addition to its present load, and unless the concrete floor is well anchored to the foundations on all sides, and these are strong enough to stand the strain, a failure of the present floor would result in a failure of the concrete floor. Such a floor as that proposed is sufficient if the supports and the anchorage to supports and walls are sufficient, but its construction should not be attempted without full directions from a competent architect or engineer with experience in concrete construction.

MOLD FOR MAKING CEMENT PIPE.

I will thank you if you will give me the address of the American representative of the German Kielberg press for making cement pipe, mentioned on page 425 of the December number. In the same article you refer to the abandonment of a plant in Brooklyn using the Sherman machine. Will you kindly tell me whether this abandonment was caused by a failure in introducing the article or was the machine a failure?

W. C. HUMPHREYS,
Norfolk, Va.

The address of H. Schebye, C. E., is 348 Carolina-st., Pittsburg, Pa., and his advertisement of the Kielberg molding press for making pipes will be found in our advertising pages.

There does not seem to have been any

great effort to introduce the Sherman machine. Reports indicate that it was used in making cement sewer pipe for use in Brooklyn, but that no machines have been used elsewhere, and now the use of cement pipe has been practically abandoned in Brooklyn. There seems to be no special reason for all this, although there were occasional complaints some years ago, when the methods of manufacture were less fully understood, of deterioration of cement sewer pipes in use. It cannot be said that the reported abandonment of the Brooklyn machine was due to defects in the machine, and it would not be proper to condemn sewer pipe made with the better knowledge of mixtures and methods of treating them of the present time on account of rather indefinite statements of occasional failures of pipe many years ago.

Some description of the Kielberg machine will be found in the department of "Machinery and Trade" in this number.

OF INTEREST TO CEMENT BLOCK MANUFACTURERS.

Kindly advise me if there are any back numbers of Municipal Engineering that would be of particular interest to cement block manufacturers. F. T. C.,
Ft. Dodge, Ia.

Reference should be made to the article in this department under the heading "Concrete Block Machines" for a full list of articles upon cement blocks. There are doubtless many more articles of interest to makers of such blocks among the many upon cement and concrete in the successive numbers of the magazine.

LIST OF CEMENT MANUFACTURERS.

Kindly send me that copy of your magazine which embraces the list of cement mills in the United States, with their output, etc. Also if you know of any corrections to be made to the list which you can make easily, I should be glad to have you advise me what they are. Also I should like to know when you expect to publish a new, revised and up-to date list. E. D. KIMBALL,
Wichita, Kas.

The best list in print, giving all the information asked for above and much more, is to be found in the "Directory of American Cement Industries and Handbook for Cement Users" ($5). A list of new companies, since the last issue of the Directory, in operation and under construction, will be found in Municipal Engineering for October, 1903, vol. xxv, p. 251.

The third edition of the "Directory of American Cement Industries" is now in active preparation for issue early in 1904 and will have the latest revised list of cement manufacturers, giving officers, capitalization, capacity, brands, sales agents and descriptions of works, besides much other information and other directory lists as is set forth more in detail elsewhere in this number in an article describing the book.

QUALITY OF CEMENT—CONCRETE BLOCK HOUSES.

Mr. R. B. Clement of Walkerton, Ont., in writing about accidental wetting of cement, as reported in Municipal Engineering, vol xxv, p. 372, says he has "no doubt it was good cement and if it had got plenty of water on it for two or three days it would have stood hard pounding." He has had similar experience. He continues as follows: "I am delighted with the last number of Municipal Engineering and think that all cement contractors should tell you the worth of it in their business."

Mr. Clement has just completed a hollow block concrete house doing the work himself with the help of a man at $1.25 a day, while masons receive $3 a day. The man alone laid three chimneys in one day at a saving of $50 over brick chimneys. The house cost about the same as brick, owing to the high price of cement when the blocks were made. With low prices for cement, such as those this winter, he can build cheaper than with either brick or wood, and give better satisfaction. The blocks are rock face. The cellar is successfully grouted with 1 part sand to 10 parts of sand and gravel.

AMOUNT OF LIME REQUIRED IN BUILDING.

Our water company makes a charge of three cents a bushel of lime for building purposes and I would like to know if you have any books that would be of assistance in figuring the number of bushels required in any building.
WILLIAM L. GIBB,
Ocean City, N. J.

Perhaps some of our readers can give rules which they have found convenient. It would be interesting to know the origin of such peculiar rates as this. Trautwine's "Engineers' Pocketbook" ($5) contains the data desired. It would apparently be simplest to require presentation of the bills for the materials actually furnished. In the absence of this definite information an estimate of the number of bricks must be made. Trautwine gives the number of standard size re-

quired per square foot of wall of different thicknesses, from which the total number of bricks can be obtained if the number of square feet of wall of each thickness is obtained from the plans of the building. He also gives the quantity of mortar required per thousand brick with various thicknesses of joints and allowance for waste, and the quantity of lime required for this mortar. There are evidently many chances for inaccuracy in these computations so that the result can be considered as only roughly approximate.

WATER-TIGHT RESERVOIRS.

With reference to water-tight reservoirs J. E. Salfisberg & Co. of Aurora, Ill., report their experience in withstanding water pressure from without. The bottom of the basin was about two feet below the river level and about thirty feet from the river bank. In construction they were bothered considerably with the permeation of water from the river and from springs underneath the basin. An 8-inch concrete floor was put in, but it heaved up in the center and 10 inches more of concrete was added to make it safe. In response to their inquiry the address of the Thayer School of Engineering is given as Dartmouth College, Hanover, N. H.

DEDUCTIONS FROM HYDRANT RENTAL FOR LACK OF PRESSURE.

A city claims to have the right to deduct from the hydrant rental a certain amount on account of the water company in case of a fire not having pressure enough to give the fire company ample water for fire protection. If you know of any cases of the above description will you refer me to the decisions?

JUDD DECKER,
Superintendent of Water Works, Sterling, Ill.

Leaving out of consideration any contract provisions which might settle the matter, the following decisions among the many which have been rendered may be referred to. Those regarding damages for fire loss on account of lack of water pressure are given as throwing a side light upon the question asked.

A contract requiring the water company to repair pipe within forty-eight hours or town will not be liable for water rents and company will be liable for individual losses caused by the condition of the pipes is not a bar to all recovery as for a breach of contract, because of occasional bursting of pipes, Grand Junction Water Company vs. City of Grand Junction, Colorado. Vol. 60, Pacific Reporter, page 196.

A water company which unconditionally contracts to supply a consumer with water and fire pressure is liable for damages for failure of fire pressure, even though the break in pipes is not the water company's fault. Knappman Whiting Co. vs. Middlesex Water Co. Vol. 45 Atlantic Reporter (N. J.), page 692.

Pleas of insufficient pressure are insufficient as complete defense to a suit for hydrant rentals, and demurrers thereto are properly sustained. Greenville, Ala., vs. Greenville Water Works Co. Southern Reporter, May 30, 1900.

A contract to furnish an ample supply of water is severable and the borough is liable for the actual service rendered in good faith under such contract, though at times the supply was inadequate. Hyndman Water Company vs. Borough of Hyndman, Pa. Vol. 7, Pennsylvania Superior Court, page 191.

Where a water company has contracted to supply fire protection in quantity and force, a failure will entitle the city to treat the contract as terminated even though no actual damage occurred. Light, Heat and Power Company of Jackson vs. City of Jackson, Miss. Vol. 19. Southern Reporter, p. 771.

A contract for fire protection between a city and a water company does not give a water consumer a right to damages from the company for fire loss due to failure of water supply in quantity or presure. Akron Water Company vs. Brownless, Am. Dig. August, 1895. Also House vs. Houston Water Works Company (Tex.). Am. Dig. June, 1895. Also Buch vs. Artesian Hot and Cold Water Company, Idaho. Am. Dig. January, 1896; and Miss. Supreme Court, Dec. 4, 1900. See Municipal Engineering, vol. xx, p. 39.

A city is liable to a patron of the city's public water works for loss by fire on account of negligence in permitting system to get out of repair. Lenzen vs. New Braunfels, Tex. 35 S. W. Rep. 341.

On the contrary, neither water company nor city owning water works is liable for damages of consumer by fire, according to Eaton vs. Fairbury (Neb.) Water Works Company, 56 N. W. Rep., 201 and Municipal Engineering, vol. vi, p. 171. Also, a citizen cannot recover from the city for fire loss, the fire pressure and supply being defective, according to Butterworth vs. City of Henrietta, Tex., 61 S. W. Rep., p. 975, and Municipal Engineering, vol. xx, 352.

Ukiah, California, obtained a judgment in a jury trial against the Ukiah Water and Improvement Company in 1890 for $570 fire damages to city property on account of defective water supply. Municipal Engineering, vol. xix, p. 418.

With the exception of the contradiction in Texas, in which the court seems to have reversed itself, the general tendency of the decisions is to reduce the responsibility of the water company for failure to supply fire service to the actual duration of the defective service, the company being able to collect for all service actually rendered in good faith, though it did fail at critical times, and to take off all liability for damages for actual fire loss on account of such failures.

BOOKS ON IRRIGATION.

What is the best work on irrigation and where can I secure it?

SUBSCRIBER, Havre, Mont.

The best book upon the technical features of irrigation engineering is Wilson's "Irrigation Engineering" ($4), the fourth edition of which has just been issued, revised and enlarged. Newell's "Irrigation" ($2), is a discussion of the subject from the economic standpoint and also contains much which is of direct value to the engineer. Mead's "Irrigation Institutions" ($1.25), is a valuable treatise upon the legal aspects of irrigation questions showing the need of some central authority in state or nation.

A review of Mead's book will be found in Municipal Engineering, vol. xxv, p. 270 and one of Newell's book in vol. xxiii. p. 294. A review of Wilson's book will appear later.

OWNERSHIP OF OLD MATERIALS DISPLACED BY NEW CONSTRUCTION.

I am the contractor for a "court" ditch in the town of Boswell. It is a common tile drain on the line of an old county ditch and I am lifting the old tile. Do they belong to me or to the town or to the people who paid for them when they were laid? There is about a hundred rods of the old 12-inch tile. The contract says nothing about the old tile. Boswell is an incorporated town.

The line goes under the railroad track. Can the railroad company make me furnish anything but the common drain tile that the plans call for?

B. F. DIMMICK, Boswell, Ind.

Detailed answer to these questions can only be made by an attorney who has carefully examined the provisions of the contract and knows the law governing this kind of work. A few general observations may not be out of place, however. If Boswell is an incorporated town the old materials would belong to the town in case nothing was said about them in the contract. The contractor is probably to some extra expense in removing them, which should be a claim against them, partly offsetting their value. If the contract is with a drainage district, the old materials would probably be considered as belonging to the district. They could probably not be claimed by individuals who paid the assessments levied for the construction of the old drain. In that case their value to the contractor after removal, due allowance being made for their condition and the extra expense of removal, might well be made a charge against the contractor, or they might be sold and the money turned in to reduce the assessment for the new drain. The attorney could give the legal steps necessary.

The railroad company probably has the right to prescribe the kind of construction which it will require under its tracks and right-of-way, provided it does not affect the main purpose of the drain. Unless the matter of extra expense in crossing the right-of-way is settled on the contractor by some provision of the contract, this extra work and extra expense for different material would probably be chargeable to the drainage district or the town as an extra, over and above the contract price. The railroad doubtless pays an assesment for the drain, but this would be independent of the question of the cost of making the crossing. Some roads insist upon doing the work on their own rights-of-way under their own officials and occasionally by their own men. It may be quite a complicated matter for settlement which would require direct assistance from the legal profession.

MAKERS OF AND DEALERS IN CAST IRON WATER PIPE AND SPECIALS.

Will you kindly give me the names and addresses of some cast iron water pipe and casting makers in Chicago, St. Paul and other middle west points?

W. N., Windsor, Ont.

There is but little cast iron pipe manufactured in the district named. The following firms have offices in Chicago, viz.: James B. Clow & Sons and the U. S. Cast Iron Pipe and Foundry Company, 217 La Salle-st., the latter having foundries located in many places.

William B. Scaife & Sons, Pittsburg.

Pa., make riveted steel pipe as shown by their advertisement in this magazine.

The American Car and Foundry Company has offices at 706 Chestnut-st., St. Louis, Mo., and the Colorado Fuel and Iron Company, Denver, Colo, makes pipe from three to twenty-four inches in diameter.

Nearly all the pipe foundries are located south and east of Ohio.

INFORMATION ON DREDGES.

Is there any book on the use of dredges in cutting drainage ditches?

H. G. P., Moline, Ill.

There seems to be no book on the market discussing this subject. The only sources of information open are the engineering and drainage publications and the proceedings of societies. The old "Drainage Journal," now combined with the "Clayworker" at Indianapolis, Ind., has in its back numbers some interesting information upon this particular class of dredging.

Can our readers refer us to publications on this subject, either books or periodicals?

ASSESSMENTS FOR SIDEWALKS AT STREET INTERSECTIONS.

Will you inform me as to general practice in assessing cost of sidewalk construction at street intersections? Is it customary to charge corner lots with that part of the sidewalk extending from the property line to the cross-walk or crossing? For instance, a street is 80 feet in width and divided as follows: A 9-foot grass plat next to property line, a 6-foot sidewalk and an 8-foot grass plat between walk and curb, with 34-foot roadway. This plan requires 40 feet of walk at each corner. Should this be a charge against corner lots or apportioned to all lots within the block or borne by the city as a general expense? Cases of this kind sometimes arise when all lots within the block affected have previously constructed the walk abutting their property, excepting the corners.

S., Havre, Mont.

The older custom is for the sidewalks to be considered practically the private property of the property-owner, and in some localities this is carried so far that negotiations for new sidewalks must be carefully conducted. In such cases the corner lot pays for the sidewalk, including the projections beyond his property line to the curb in each direction, unless concessions are made to induce a backward owner to improve his walk, the town proposing to pay the cost of this part, or the neighbors agreeing to meet part of the expense.

Where the town exercises a little control over the kind and cost of sidewalks, largely by sufferance, it is most likely to pay the expense of these extensions.

Many cities pay a share of the cost to induce property owners to put down a better class of walks. Thus the northern cities which are desirous of displacing the old wooden sidewalks wtih cement or brick offer to pay out of the city treasury a certain proportion of the cost of the better walk, which may or may not make it cost less than the plank walk. In such cases the city's contribution is likely to be considered payment in full of its share and the remainder of the cost is assessed in the way in vogue in the city, though, even here, if the cost of the better walk is greater to the property owners than that of the cheap one the city may pay for these excess walks at the street intersections.

It is hardly equitable to require the corner lot to pay the cost of the forty feet of walk referred to, and in case the private ownership idea prevails, this part of the walk might well be considered the property of the city and be paid for as such out of the city treasury. This is perhaps the most satisfactory method under such conditions.

The most modern idea, however, and that which gives the most satisfaction when it is once in vogue, is to consider sidewalk improvements as upon exactly the same basis as street improvements. In that case the sidewalks at the intersections of streets would be paid for in the same way that pavement of the roadways of the intersections is paid for. In Indiana cities, for example, where the property owners pay all the cost of the pavements, the cost of the entire sidewalk would be assessed against the aggregate frontage and the cost of the intersections would thus be distributed over the entire frontage on the walk. In case some walks are already constructed, the cost of the intersections may be computed separately and property not coming under the assessment for walk abutting it would receive a small assessment for these intersections. In another class of cities, where the city can or must pay a proportion of the cost, the assessments may be made in proportion to the amount left after deducting the city's share. This works well if the assessment for the intersection is spread half way down each of the sides of the block at the corner on which the intersection is laid, and is perhaps the simplest method which is equitable.

Perhaps our readers can cite still other methods.

LIMESTONE IN A CORD—GRASS IN GUTTERS.

Will you kindly inform me as to the number of pounds of limestone that it takes to make a cord? Also the best way to prevent grass from growing through cobblestone gutters.

FRED T. WILLIAMS,
City Engineer, Petoskey, Mich.

A cord of stone is presumably the same as a cord of wood, 4 by 4 by 8 feet, or 128 cubic feet. If the limestone, quarried in irregular fragments, is piled in cord form 1 cubic yard of the solid stone in the quarry will make about 1¾ cubic yards in the pile, according to Trautwine, and the pile will weigh 96 pounds per cubic foot, as against 168 pounds for the solid rock. This would make a piled cord of limestone weigh 128x96, or 12,288 pounds.

The only way known to the writer to keep the grass permanently out of the cobblestone gutters is to fill the spaces between them completely. This can be done by laying them in a bed of concrete or mortar, or if they are already laid, by cleaning out the joints and filling them with Portland cement mortar. Perhaps some of our readers will report their experience.

CITIES PUMPING SEWAGE.

Mr. N. S. Frost, City Engineer of Petaluma, Cal., makes the following addition to our information about cities which are obliged to pump their sewage:

In reply to your inquiry on page 178 of the September Number of your magazine, in regard to cities that have sewer pumping plants, I would say that Santa Cruz, Cal. (population in 1900, 5,659) pumps nearly all its sewage over a bluff into the Pacific Ocean. I do not think it possible to ascertain the cost, as the same power is used for pumping and to run the lights and whatever may be the system now, at the time I was City Engineer, (during the early 90s.) no separate accounts were kept. I know that the cost of operating the station was considerable.

The main portion of the town lies in a basin, and the only outlet to the ocean is at the foot of the Main street, too close to the bathing beach to permit the discharge of sewage. The sewage of that portion of the town is collected in a reservoir and pumped over the bluff, at a point where the current carries it away. The lift from the bottom of the reservoir is about sixty feet. No storm water or roof water is allowed to enter the sewers, but the last thousand feet or so of the pipe runs through a swamp and the leakage through defective joints adds a great deal to the quantity to be pumped, and of course to the expense.

The city of San Rafael, Cal. (population 3,879) also had at one time a pumping plant, but I believe that they have abandoned it on account of the expense and constructed a gravity outfall in place of it.

PLATES FOR NUMBERING HOUSES.

I am in need of various kinds of number plates for numbering of houses, so that property owners can have a choice of styles, as I have a contract to renumber the city. Please give me the adresses of Manufacturers in stamped and cast metals, nickel plated, etc.

W. F. B. —, Ga.

Perhaps the Franklin Rolling Mill and Foundry Company of Franklin, Pa., whose advertisement of street signs will be found in our advertising pages, can furnish house numbers also.

If not, the following may be referred to:

Arcade Mfg. Co. brass and aluminum house numbers, Freeport, Ill.

Trevor F. Jones & Co., 374 W. Broadway, New York City.

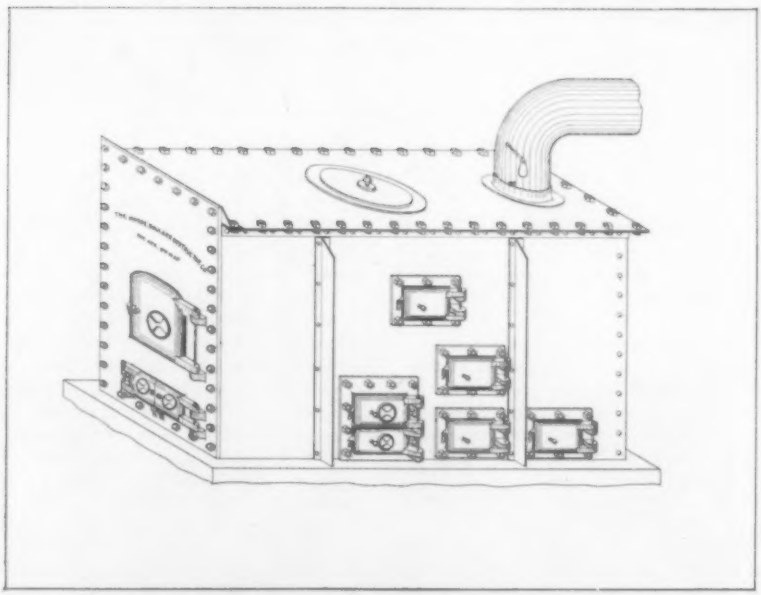
Nicol & Co., 57 W. Washington, Chicago, Ill.

Enameled Iron Company, Beaver Falls, Pa.

Dayton Stencil Company, Dayton, O.

Wadsworth Engraving Company, Springfield, O.

1. MORSE-BOULGER DESTRUCTOR AND GREEN'S ECONOMIZER IN LIT BROS.' DEPARTMENT STORE, PHILADELPHIA.



2. MORSE-BOULGER DESTRUCTOR, STANDARD No. 1.

GARBAGE DISPOSAL

The Sanitary Disposal of Municipal and Institutional Waste by Cremation.

The following selections from a paper by W. F. Morse, sanitary engineer, read at the recent meeting of the American Public Health Association, give a clear statement of the principal reasons for the success in garbage destruction in England and the practical failure in this country.

A review of the work accomplished in the field of disposal of city waste by cremation will show that in three years a number of furnaces have been put in operation which for various reasons have been retired from service, abandoned or suppressed.

It would be a hopeless task to enumerate in detail the various instances of failure, or to explain the causes of the unsatisfactory results that have been attained by these so-called "sanitary and efficient" cremating furnaces. It is enough to say that of the seventy-five crematories which three years ago were in operation, or were contracted for, there are today less than forty in continuous use.

It is obvious to anyone examining the subject, with any degree of care that, if the disposal of waste by this means is to make real progress, there must be radical changes in methods of business, in design, material and construction.

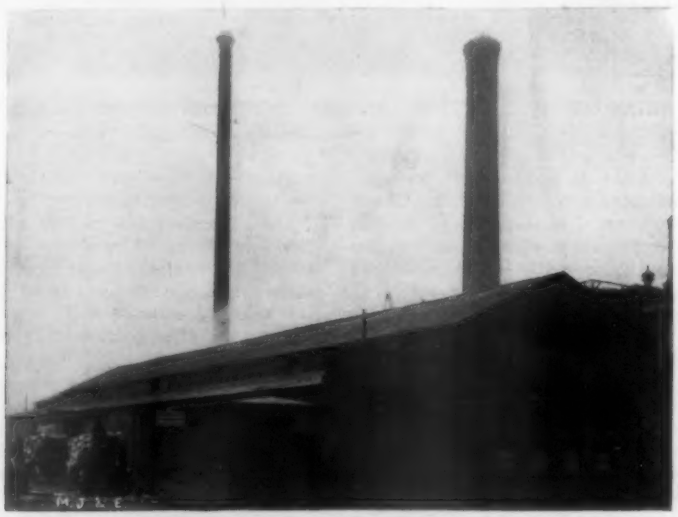
Yet not all the skill and experience obtained from years of work in this line has been lost, or allowed to remain unproductive. Distinct advances have been made in the direction of the sanitary destruction of the waste of great business establishments, public and private institutions, and in certain departments of the government.

In the basement of several large department stores have been placed destructor furnaces connected with the upper stories of the building by a chute which carries the waste to a room where it is sorted over by men in charge of the operation of the plant, the valuable portions recovered for market and the remainder used as fuel for the destructor.

3. MORSE-BOULGER DESTRUCTOR,
St. Luke's Hospital, New York City, After Ten Years' Use.

This method of dealing with department stores waste is expeditious, sanitary and inexpensive. The heat produced by the waste more than pays the expense connected with the system and may be applied in several different ways. In Lit Bros.' store, as shown by Fig. 1, by means of a flue attachment to an economizer it is utilized for heating the feedwater for a battery of boilers aggregating 1,000 H. P., the temperature of the water being raised to 260 degrees without the consumption of fuel other than the waste

4. MORSE-BOULGER DESTRUCTOR,
Disposal Station Kings County Institutions, Brooklyn.



5. BOSTON REFUSE UTILIZATION STATION. EXTERIOR.

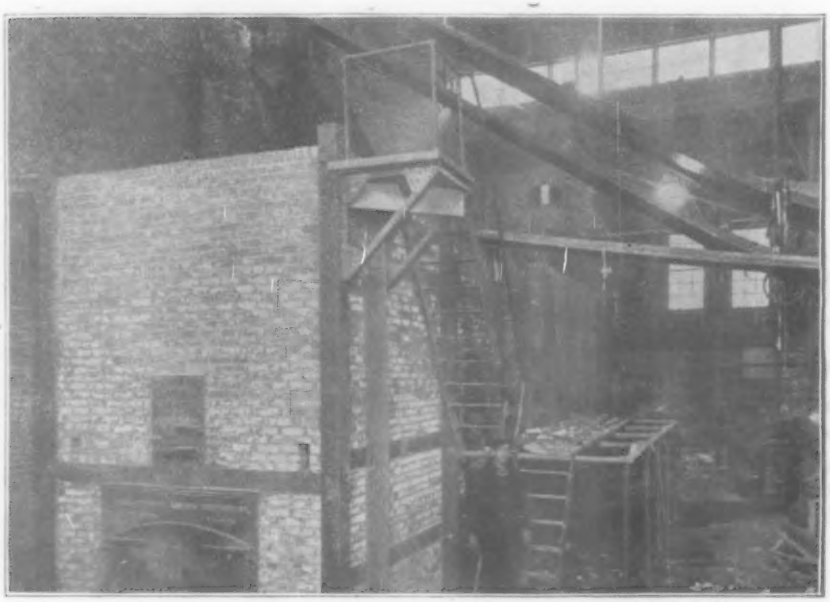
of the establishment. This means a saving of from three to four tons of coal per day during the time that the waste is used. The plan of the destructor is shown more clearly in the perspective drawing, Fig. 2.

In another case the heat from a destructor furnace is introduced under the fire boxes of a boiler of a very large capacity and is used as auxiliary for the production of steam power. Again, in another instance, a steam boiler is attached to the destructor placed in the basement of a large hotel which has a daily capacity of upwards of four tons of garbage.

the employment of destructor furnaces which the experience of four years has shown to be a factor for sanitation and economy in the administration of the municipal government.

This form of disposal of city waste has been carried farther by the installation of a Refuse Utilization station in Boston, views of the exterior and interior of which are shown in Figs. 5 and 6.

The city of Buffalo is about to construct a similar plant which will recover a large proportion of the valuable parts of the city refuse and consume the remainder in a destructor, the heat from which will be utilized to pump the sewage of a large



6. THE MORSE-BOULGER DESTRUCTOR. INTERIOR REFUSE UTILIZATION STATION, BOSTON.

Among the first in the country to recognize the value of destructor furnaces were the sanitariums, hospitals and similar public and private institutions, and for more than twelve years in some of the large cities of the country the waste of hospitals and institutions has been destroyed without unsanitary results and with perfect economy and efficiency. Fig. 3 shows the Morse-Boulger destructor in St. Luke's Hospital, New York City, after ten years' use. Fig. 4 shows the exterior of the destructor station at the Kings County institutions, equipped with a similar furnace.

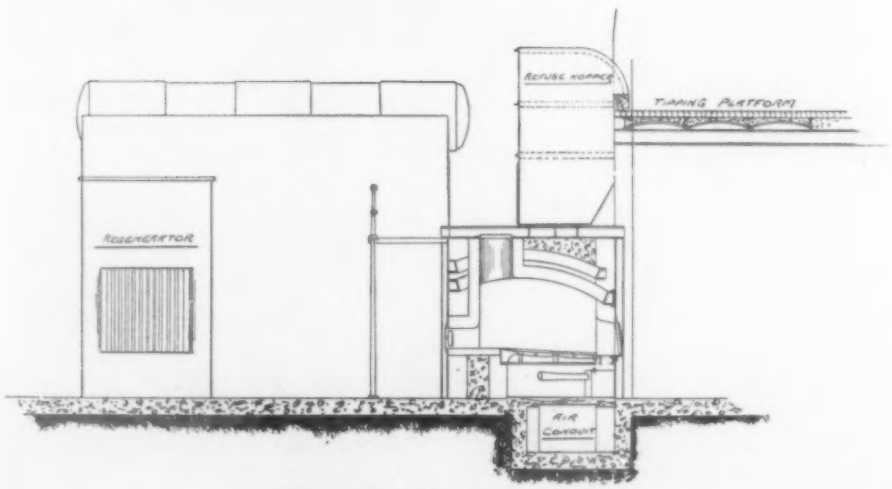
There is another field of usefulness for

section of the city containing nearly 200,000 of the population.

There is no place in the world where the destruction of municipal waste is of more importance than in the tropics, since the rapid decay which seizes upon all rejected animal and vegetable substances requires swift and efficient method of disposal.

When Manila was taken possession of by the American troops it was found that an unsanitary condition of affairs which was in the highest degree offensive and dangerous existed under the Spanish regime. The plant shown in Fig. 7 was constructed to destroy all the waste of the

7. THE MORSE-BOULGER DESTRUCTOR AT MANILA, PHILIPPINE ISLANDS.

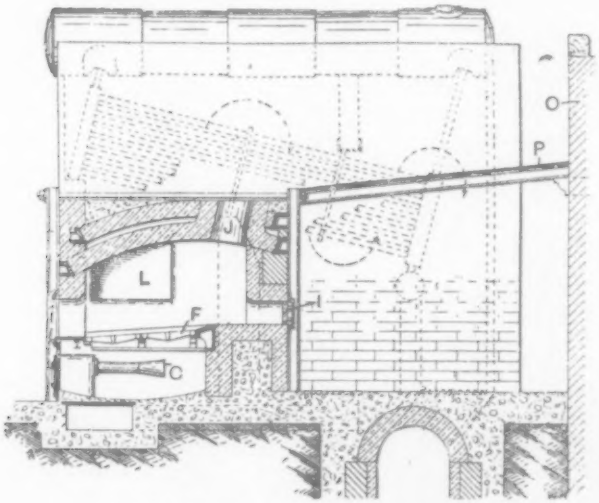


8. MELDRUM TOP-FEED "SIMPLEX."

city. It is one of the largest single plants in operation in the United States. Reports from there indicate that there is destroyed by this furnace a larger amount of waste than was stipulated for in the contract, which was to be upwards of 120 tons daily.

The secret of the rapid and complete combustion of this waste is a matter which has heretofore baffled most American crematory builders. When garbage is destroyed in the ordinary American crematory by natural chimney draft the heat rarely rises to a temperature above 800 to 1,000 degrees. The proportion of 40 to 60 degrees of moisture in the garbage delays ignition and combustion, and the use of fuel for the evaporation of this water is necessary. But if combustion is stimulated by forced draft in the ashpit of the fire boxes, and the manipulation and charging of the furnace are so managed as to dry a portion of the garbage for use as fuel, combustion is not only maintained but is raised to a higher temperature than it is possible to attain by natural draft. This is the principle upon which the English destructors operate, and is the same as that successfully employed in the foregoing instance. The same apparatus in similar constructions in the United States will destroy an equivalent amount of mixed waste with the same proportionate expenditures for fuel.

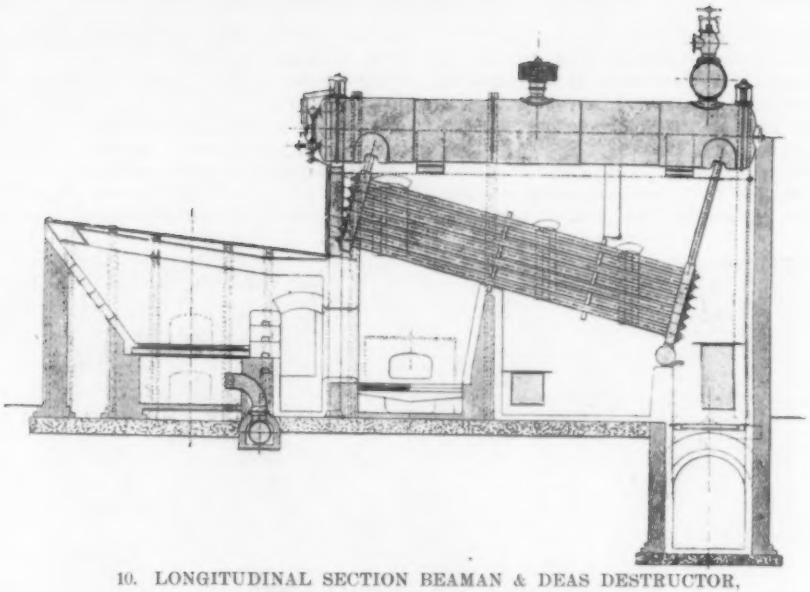
The final word in favor of the disposal of city waste by fire has yet to be said. Undoubtedly it will be merely a repetition of the statement made by the eminent sanitarian, Lord Kelvin, when he said that the waste of any city when properly consumed and the heat applied to the production of electric power, would be sufficient to furnish a light of eight candle power for every individual in the city during the three hours when light is necessary. At the time when this statement was made it appeared to present a fanciful and impossible idea, but it has been more than realized by the results of practical work. Within four or five years there has developed in England a class of destructor which will consume every kind of municipal waste without nuisance, will developed steam power in the proportion of one and one-half to two pounds of water evaporated for every pound of waste consumed, and will produce a residuum useful for many kinds of municipal work.



9. CROSS-SECTION MELDRUM DESTRUCTOR.

Reports received from the latest installations of this powerful apparatus show that the actual results are overwhelmingly in support of the statement made by Lord Kelvin.

A paper read by Mr. W. F. Goodrich, M. I. C. E., before the British Association for the Advancement of Science at Southport in September last, contains perhaps the best report of this line of sanitary work that has yet been published. The writer shows that in twenty-five years, to two installations in two towns there have been added 180 more, and also that the two first "Fryers" destructors, built at Manchester and Leeds, are still in use, both fitted with forced draft. This



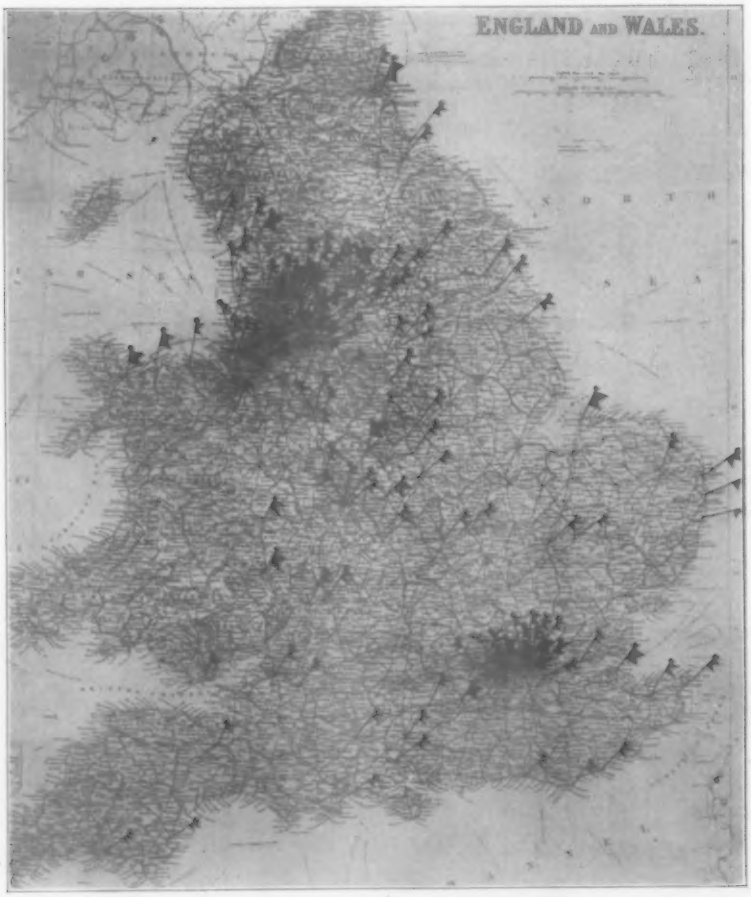
10. LONGITUDINAL SECTION BEAMAN & DEAS DESTRUCTOR,
With Steam Boiler, Air Blast, etc.

11. THE BEAMAN & DEAS DESTRUCTOR, DARWEN, ENGLAND.

innovation, only some five or six years in use, is the really vital improvement in furnace construction. By this means the temperature has been raised from 500 degreee in 1896 at Hull before the adoption of forced draft to 3,000 degrees in 1902 at Walker-on-Tyne.

It has led to the use of powerful steam boilers developing one-horse power of steam from the combustion of ten pounds of "town's refuse"—corresponding to our mixed city garbage, ashes and refuse—and very nearly the same in all essential particulars. The high temperature system has rendered nuisance practically impossible, the improvements in design have prevented the escape of dust, and the residuums produced are perfectly inoffensive and are used for a variety of purposes. One ton (2,240 lbs.) of average refuse will generate a similar quantity of high pressure steam.

Of the 180 towns in Great Britain where destructors are installed sixty-three combine these with electricity works for the lighting of the streets, and in forty towns these destructors are combined with the sewage works. From one ton of town's refuse 40 B. T. electrical units are generated at Nelson, the average being 30 units per ton, equivalent to 40 h. p. hours of energy. Five years ago only two towns had adopted destructors combined with electricity works, but since then sixty-one others have adopted the method. This has been done in many places, notably Liverpool and Nottingham, where the towns already have lighting works of large capacity. The destructors are centrally located, thus reducing the cost of cartage



12. MAP OF ENGLAND AND WALES,
Indicating Number of Destructor Furnaces in Use.

to the minimum. They are placed in close proximity to public offices, schools and all classes of buildings, without objectionable results such as noxious fumes or offensive odors.

In three cases the destructors are combined with waterworks, and the city thus delivers its water supply by the destruction of its waste.

There are 1,650 destructor cells in operation or in course of construction in Great Britain, with 300 steam boilers employed.

Figs 8, 9 and 10 show sections of prominent successful furnaces used in England and Fig. 11 is a photograph of the Beaman and Deas Destructor in use at Darwen, England. Fig. 12 is a map showing the location of refuse destructors in England and Wales and shows in the clearest possible manner the extent of the development in twenty-five years, much of it having taken place in the last six or eight years.

Destructors have been built after the same plans in Australia, New Zealand, South Africa, Germany, France, Belgium and South America, which destroy the miscellaneous city waste of every class, employing the steam power for various purposes, and operating in the same efficient, sanitary and entirely satisfactory manner that has been so well demonstrated by the work performed in English cities and towns.

This, then, is the successful result we should look forward to in this country. There is no radical difference in the character of the people and the manner of living, or in the nature of the waste elements discharged from the life of the people. With the same agencies acting under similar conditions, employed upon the same class of work, it is as certain as daylight that equally profitable results are to be attained. It is only a matter of a clear understanding of the results achieved abroad, and of opportunity for the application of the same methods in this country.

MUNICIPAL MATTERS IN COURT

Higher Courts—Joplin Lighting Plant—Indiana Gravel Road Law—Front Foot Assessments—Extras on Contract—Logansport Street Assessments—Houston Water-Works—Sioux Falls Water Plant.

Abstracts from Decisions of the Higher Courts.

Assessments of Railroad Right-of-Way—R. S. 1893 sec. 120, provides that a railroad right-of-way shall be taxed as personalty, and that such right-of-way gives the company only an easement in the land. It was held, however, that the company was liable for an assessment for the improvement of such road bed as for any other real estate. But in determining the amount of the assessment, the commissioners may not adopt the valuation placed upon the road bed and right-of-way by the corporation commission, because the railroad commissioners in their determination of value consider elements other than the value of the land and the improvements thereon. In determining the amount of the assessments only these elements of value may be considered.—Cheatham County Commissioners vs. Seaboard, etc., 45 S. E. Rep. (N. C.) 566.

Assessments—The statute provides that cities of the third class shall pay for paving and curbing streets, which they have previously graded, by a special assessment. The ordinance may include the cost of grading in this special assessment, if in the judgment of the council, this general fund of the city does not warrant such an expense, providing such ordinance declares the general fund insufficient. In this case the ordinance did not declare the general fund to be insufficient to pay the expense of grading and the contractor was not permitted to recover against the abutting property owners on tax bills issued to him.—City of Sedalia, etc. vs. Abell et al. 76 s w. rep. (Mo.) 497.

Assessment Warrant, Must Be Paid—This was an action to enforce an apportionment warrant for the construction of a sidewalk. The work was done under section 3706, st. 1899, which does not require the town trustees to permit the property-owner to do his own work. However, the trustees did give defendant such privilege. It was then discovered that the ordinance as passed did not justify the privilege granted, and the defendant was compelled to pay the warrant. It was also held that after the work has been accepted by the council the defendant will not be heard to say that the street grade was not properly fixed. Eversole vs. Walsh, 16 S. W. Rep. (Ky.) 358.

Time for Assessment Defense—This was a suit for a delinquent special assessment. In relation to the different questions raised the court found—1, that where a judgment has been entered confirming a special assessment under an ordinance which has been subsequently repealed, the property-owner may interpose this judgment as a defense in the proceedings for the making an assessment for the same improvement authorized by a subsequent ordinance, but—2, this defense may not be made (sec. 48, c 23, Hurd5s R. S. 1899) to an application for judgment for sale for delinquency. It must be made at a proper time. People ex-rel. Raymond et al. vs. Fuller, 69 N. E. Rep. (Ill.) 371.

Collection of Water Works Rentals—The unanimous vote of the city council to accept offered terms authorizes the installation of water works but does not authorize the Mayor to sign a contract for water and silence of Council upon his report is not ratification of it. The city may assess more than five mills on the dollar for payment of water rentals. The city cannot defeat recovery of rentals when it has recognized plaintiff as owner of works by showing that it has not consented to the assignment of the original contract to the plaintiff. Marion Water Company vs. City of Marion, 96 N. W. Rep. (Iowa) 883.

Lighting Contracts—The charter of the city of St. Paul provides that the acceptance of bid for the lighting of city streets, pursuant to a notice and according to plans and specifications, is a proceeding to be taken only by resolution, ordinance or by-law. An action by the Council whereby it accepted such a bid by motion is void. Broderick vs. City of St. Paul et al., 97 N. W. Rep. (Minn.), 118.

Sidewalk Construction—The statute provides that a sidewalk ordinance may require all abuting property owners to construct sidewalks upon their abutting property, etc., and court held that may shall be read shall. When the council determines that certain sidewalks shall be constructed and paid for by special taxation, this is finding that such walks are needed and that the property will be benefitted to the amount of the taxation. This finding will not be interfered with in the absence of an abuse of discretion. Pierson vs. People, ex rel Walter, 68, N. E. Rep. (Ill.) 383.

Sidewalk Grades—Grades of streets may be established for the building of sidewalks by ordinance and not by resolution. An ordinance prescribes a permanent rule of conduct of government, while a resolution is of a special and temporary character. It was held that an ordinance providing that there should be an excavation of earth four inches below the established grade, "except where it would be better, on account of drainage, to excavate less or grade up at low places," was defective in failing to show a grade with sufficient certainty.—McDowell vs. People ex rel. Martin, etc. 68 N. E. Rep. (Ill.), 379.

Petition for Local Improvements—The statute provides "that when any ten resident owners" of real property in any city etc., shall petition the City Council for any local improvement, such Council shall lay out the entire city or part thereof, as the case may be, into improvement districts. A petitioner must not only be an owner of real estate in a given district, but a resident thereof; and the provisions of this statute are mandatory and jurisdictional. Board etc., No. 60 vs. Cotter, 76 S. W. Rep. (Ark.) 552.

Joplin, Mo., May Build Its Own Lighting Plant.

The United States Supreme Court rendered a decision recently in the case of the city of Joplin, Mo., vs. the Southwest Missouri Light Company, in favor of the city. The right of the city to erect a municipal electric light plant to be operated in competition with those of the present light company was involved.

Indiana's Gravel Road Law is Constitutional.

The Indiana Supreme Court has declared constitutional the gravel road law enacted last spring. Suit was brought by Melvin L. Bowlin to prevent the construction of a road in Tipton county and the collection of assessments for its cost. He claimed that the title was defective and provided for taking property without due process of law; also that it conferred class privileges.

Indiana Form of Front Foot Assessment Law Upheld.

The Indiana law for the assessment of the cost of street improvements was upheld in an opinion handed down by the United States Supreme Court at Washington, Nov. 30.

A property owner in Irvington, Indiana, was assessed over $5,000 for street improvements. She resisted payment and the contractor foreclosed and obtained judgment. She appealed to the United States Supreme Court, alleging that the act of the Indiana Legislature, under which the assessment was made, is unconstitutional, in that it provides for an assessment by the front foot. She also alleged that no hearing was had before the Board of Town Trustees to determine the actual benefits; that all of the members of the board were residents of the town and taxpayers, and that two of them were interested parties because they owned lots abutting on the improvement and that its acts were therefore nugatory. The United States Supreme Court holds that an arbitrary assessment by the front foot would be unconstitutional, but it explains that, under the Indiana law, the front foot assessment is subject to alteration or review by the Board of County Commissioners or the Board of Town Trustees, upon a basis of special benefits and that, if the commissioners or trustees refuse to consider the question of special benefits, the property holder's remedy is by mandamus or injunction to compel a hearing as to the amount of assessment on each lot, and, further, that a lot owner cannot waive such a remedy and make a denial of a hearing available as a defense in an action to collect an assessment. The Supreme Court says it finds nothing in the law repugnant to the constitution of the United States and therefore it is upheld.

The argument that two members of the town board were interested property owners is disposed of as follows:

> Although it might have been more seemly for those two members, if they recollected the fact of such ownership, to have refused to act in the matter, yet there is nothing to show their attention was called to the fact.

The judgment of the Indiana Supreme Court is affirmed and the costs are charged against the plaintiff.

Suit for Extras on Chicago Water Works Tunnel Decided.

The Illinois Supreme Court refused a hearing in the Weir, McKechney & Co. case, Dec. 16, which case grew out of the McKechney contracts on the northwest land tunnel of the Chicago water works. The contractors sued the city of Chicago for extras on their tunnel work which the city had refused to pay. The city claimed that the contractors had not fulfilled their contract on their section of the underground construction; also, that they had used material of a kind which was not specified in the contract. The amount at stake with interest was about $700,000.

Logansport Street Assessment Affirmed.

The Indiana Supreme Court handed down a decision Dec. 11 sustaining the judgment of the Cass County Circuit Court in a case filed against the Central Bermudez Company by Lizzie W. Brown et al., at Logansport, Ind. The plaintiff asked that the assessment against her property for paving Market-st. with asphalt, be paid by the city or charged against the account of the Asphalt Company. The complaint set forth that the improvement was ordered when 81 per cent. of the property-owners were against the improvement and that the council passed the order without a two-thirds vote, which was specified by law. The decision of the Supreme Court is as follows:

> (1) A stipulation that all matters bearing on the rights of the parties may be proved and considered under the pleadings, as they then are, waives prior exceptions to rulings on demurrers. (2) Where a city council proceeds under section 4,292, Burns, to pave a street at the expense of abutting owners, without a preliminary petition for the improvement, it is not essential to jurisdiction that two-thirds of the council shall vote in the first instance for an order that the improvement be made and that the clerk shall advertise for bids, if the necessary two-thirds vote in favor of entering into a contract with the successful bidder. If such vote is cast, and the proceedings thereafter until the assessments are confirmed be regular, such assessments are proof against a collateral attack on the ground that a bare majority first ordered the improvement. (3) The preliminary acts of the council are ministerial only.

Houston Water Works Construction Enjoined.

A recent decision by Judge Waller T. Burns of the United States Courts for the southern district of Texas, completely ties up the city of Houston on the water works proposition until a hearing can be had at the next term of the Federal

Court, which convenes in February. The city could resort to filing a motion to dissolve the temporary restraining order continued in force by the decision of Judge Burns, thereby securing a dissolution of the order prior to that time. Judge Burns continued in force the temporary restraining order granted by Circuit Judge McCormick at Ft. Worth. The city did not file an answer in the case, but simply a pleading denying the jurisdiction of the Federal Court over this case. The court holds as follows :

1. That the plea of the city to the jurisdiction of the court be overruled.
2. That the injunctions heretofore granted by Judge McCormick be continued.
3. That the city be required to remove the sanitary sewers emptying into Buffalo bayou above the water company's dam, and also to remove and abate the polluting nuisance complained of in the plaintiff's bill.
4. That the city be enjoined from advertising for bids, or attempting to enter into any contract, in derogation of its contract with the water company, for supplying to the city water for fire hydrants and public purposes and from otherwise attempting to enforce the ordinance of Oct. 6, 1903, declaring the franchise of the water company forfeited and its contract with the city terminated.
5. That the city be enjoined from enforcing any reduction of rates for water furnished to private citizens.
6. That the city be enjoined from taking water from the water company and using same without paying for it, or providing for the payment thereof, in a manner satisfactory to the water company.

Sioux Falls May Complete Its Water Plant.

In a decision rendered by Judge John E. Carland of the Federal Court, Nov. 12, he refused to issue a temporary injunction restraining the city of Sioux Falls, S. D., from proceeding further in the construction of a new water plant. The South Dakota Water Works Company has sought to impede, step by step, the work of the city. The company has always met with defeat in the state and federal courts. Judge Carland holds that the issue of $210,000 water works bonds is valid. The decision is as follows:

The application for a temporary injunction is addressed to the sound discretion of the court. There being no answer denying the allegations of the cross-bill, but a demurrer thereto, all matters in the bill that are well pleaded must, for the purpose of this motion, be taken as true. Taking them as true, a case for a temporary injunction is stated, if there are not other facts appearing which must control the discretion of the court. This action, speaking now of the original bill and cross-bill, has been a continuing menace to the peaceful construction of a system of water works by the city of Sioux Falls, ever since Nov. 30, 1901, and will continue to be until its merits are finally decided by an appellate court. Notwithstanding the pendency of this action, it appears from the undisputed statement of the mayor of the city, under oath, that the city of Sioux Falls is now engaged in building and constructing a system of water works for domestic uses. That said city has already purchased pipe for entire system, about ten miles of which have already been laid in the ground, and the balance of said pipe is on the ground ready to be laid and is being laid daily by the contractors. That said city has already purchased necessary engines, boilers, pumping plant, pumping station and all other machinery necessary to complete the same. That some of the machinery that has been ordered in special work and manufactured especially for said plant. That the money already actually paid out for material and labor in the construction of said plant, and the machinery, material and work already done, all of which has been purchased or let by contract, amount to about $190,000. That everything needed for the building and construction of said water works system, ready for use, with the exception of one or two items, has already been purchased or contracted for. The city in so doing has assumed the risk of an adverse decision in this case, but that is not the question now before the court.

The question now is: What right or property of the South Dakota Water Company will be injured prior to the hearing of this case on the merits, by refusing a temporary injunction? It is difficult to see any injury at all. On the other hand, what inconvenience and damage might result to the city if the temporary writ should issue? The damage to the city if it shall finally be successful in this litigation would be great and irreparable. It would be nearly impossible to fix with intelligence the amount of the bond that would be necessary to protect the city in case the temporary writ should issue and be finally dissolved.

The court, therefore, bearing in mind that courts of equity, should be very cautious in the use of the writ of injunction prior to the hearing on the merits, and in the exercise of a sound discretion, will balance the inconvenience and damage which the city might suffer by the issuance of the writ as against any injury that the water company might suffer thereby, and in so doing the court finds that the weight of inconvenience and damage is all on the part of the city, if the city shall fail in its contest, the damage will be upon itself not on the water company.

WATER AND SEWERS

Wilmington Filtration Contracts—Extension of New York Supply—Purification of Cincinnati Water Supply—Finances of New York Water Department—Concrete-Steel Standpipe.

The Wilmington, Del., Water Filtration Contracts.

The city of Wilmington, Del., is a city large enough to keep out of difficulties due to failure to obtain independent expert technical advice into which small cities so often fall, but it has not learned from its own past experience and is now in trouble over a contract for a new filter plant for its waterworks, proposed to take the place of an old plant on which the city authorities did not take disinterested advice, and which has proven inadequate.

The Water Board of the city made a contract in March, 1903, with the United States Sand Filtration Company for the preparation of plans for the proposed filter, the use of patent rights and the prospective supervision of construction in which were the following provisions, stated as briefly as possible:

The company agrees to present preliminary plans for the entire plant within 30 days, to receive the city's modifications within 30 days, and to complete the plans in 60 days more, for which it is to receive 2½ per cent. of the estimated cost of the works on completion of plans and an additional 2½ per cent. of the contract price on letting the contract, provided that is within the next three months, otherwise this second payment is to be the same as the first. The city is given the right to use certain patents on details, and any future patents of the company on payment of 10 per cent. of the estimated cost or the contract price, computed under the same conditions as the fee for plans. The company is to be free to bid on the construction and in case it receive the contract agrees to bond itself for $100,000 to $125,000 to construct according to contract, and that the plant will filter 4,000,000 gallons an acre per day, the filtrate to contain not more than 40 bacteria per cubic centimeter on a three months average; the company to make at its own expense any change necessary to produce this efficiency. In case the company obtains the contract it will receive nothing for plans and supervision.

An arbitration board is provided for in case of disputes, the expense to be divided between city and company, one member to be chosen by each and the third by these two, or in case of failure to agree, to be chosen from three names given by the president of the American Society of Mining Engineers, the city to reject one, the company the second and leaving the third to serve.

It is estimated in Wilmington that the 15 per cent. of the contract might amount to $187,500.

It seems that when Mr. P. J. Ford became a member of the Water Board, some time after the making of the contract, he objected to its provisions and when the time came for the first payment under it he procured large concessions from the company, whereby the company is to receive $65,000 in lieu of the sum computed as above, the company to give a bond of $150,000 for the efficiency of the plant and to defend the patents. Mr. L. K. Davis of the company was to receive $10,000 for services as consulting engineer. Mr. Ford considers this contract acceptable only because it is a great improvement over the first one—perhaps as great as could be obtained at that time.

Mayor Bird refused to approve this contract and demanded the resignations of the other two members of the board, one of which was received. Upon the refusal of the other to resign he was removed by the City Council, and Mayor Bird asked Mr. Ford to select his two colleagues to succeed them.

The company has entered suit for the $20,000 under the new agreement and also a suit for $100,000 damages for breach of contract.

The latest news from the city intimates the cancellation of the first contract by the Water Board if it is not already void on account of irregularities in its adoption, such as failure to secure the approval of the city solicitor, as required by law; also that Mr. Davis will not be retained as consulting engineer.

The sufficiency of the plans and the efficiency of the filtration system have

not been called in question, but the troubles of the Water Board are due to lack of proper consultation with the legal advisers of the city and also to a considerable extent to lack of proper engineering advice.

The moral is easily drawn, but its application to any particular case is not likely to be made under the present method of government of most American municipalities.

Extension of New York's Water Supply.

The final report of the special commissioners appointed by Mayor Low of New York City to advise regarding the extension of the city's water supply was submitted to the board of estimate Dec. 18. The commission recommends the immediate construction of a filtration plant for the Croton water supply. The Housatonic, Wallkill and the Ten Mile rivers are discarded as possible sources of supply because they flow into another state and to select them would be to invite litigation. These rivers had been regarded as some of the most likely sources for an additional supply. The commission, which is composed of Messrs. John R. Freeman, Prof. William A. Burr and Rudolph Hering, in reference to Brooklyn and Long Island says:

It has long been known that both the shallow and deep lying sands of Long Island are saturated with water so as to form a great storage volume for that portion of the rainfall finding its way into the sub-surface sands. A large part of the commission's work has been devoted to investigating this question in order to determine, if practicable, what volume of water may be found in these sub-surface sands and to devise the best means of securing it. The Borough of Queens is pressingly in need of additional water, and the Borough of Brooklyn has also reached that point where it must have additional water of good quality. It has already begun to filter its present surface supplies, which are more or less polluted by the increasing population of the southern portion of Nassau County.

It is not generally known that ground water constitutes one of the best possible sources of municipal supply. Indeed, the Commission practically asserts that at the present time no municipality can be considered satisfactorily supplied with water unless that supply is either filtered artificially or naturally, as in the case of ground water. The exceptional excellence of ground water and the availability of this great underground storage on Long Island for the boroughs of Brooklyn and Queens, have prompted the Commission to make an exhaustive investigation of that source. A large force under the Commission's direction was engaged in making observations upon the elevation of this ground water in nearly 1,500 wells, the greater part of which are the usual open country wells and the remainder small driven wells made by the forces of the Commission. These investigations were extended over about 1,000 square miles of territory on Long Island, embracing Queens Borough, Nassau County, and a portion of Suffolk County. These saturated sands, constituting this great underground storage volume, reach nearly or quite to the surface at some points; but in the higher portions of the island they may be more than 100 feet below the surface. These investigations disclosed such a large volume of underground water that the Commission recommends extensions of the supplies for the Boroughs of Brooklyn and Queens in the direction of developing means for securing as much as possible of it. At the same time the 500,000,000 gallon supply from the north is to be made available for the same boroughs when desired, by suitable pipe lines extending across East river from the new high-service distributing reservoir north of the city.

The general recommendations are about as follows:

It is recommended that works be immediately begun for the filtration of the Croton supply, and that all the new supplies be filtered. It is also recommended that the reservoirs in Central Park be cleaned and that they be covered as soon as the Croton supply is filtered.

The waste of water has been investigated and found largely due to defective plumbing and fixtures. The leakage from street mains is found to be less than heretofore supposed. This problem of the amount of distribution of the water waste is an extremely difficult one, and it is recommended that these investigations be continued and extended by permanently districting the city for this purpose and ascertaining the inflow and outflow for each district, and that the cause of the large night flow be more fully investigated.

The commission recommends further for the prevention of waste that the house-to-house inspection be continued and extended; that the rate of consumption in representative buildings be studied; that more stringent plumbing regulations be enforced and that meters be more generally applied. It is strongly of the

opinion that notwithstanding the greatest possible reduction of waste a large additional supply of water is imperative.

It is found that all boroughs of the city of New York are in need of an increased supply of water. The present supply is already drawn upon to an extent that might lead to a dangerous shortage in a year of drought.

The cost is estimated at $99,000,000.

The Clarification of Ohio River Water at Cincinnati.

The following paper by Frank J. Kelley before the Central States Water Works Association gives a brief and interesting account of the methods of purification of Ohio river water to be used in the works now under construction at Cincinnati:

As an employe of the Cincinnati water works, I have charge of the hydrant branches, meter and pipe extensions. One of the disturbers of my sleep and peace of mind is mud. Often I have been awakened at night to help some consumer out of his trouble, because of stoppage of his pipe or meter by mud.

For the information of those who are not acquainted with the conditions of Cincinnati, it is necessary to state that the water of the Ohio river is delivered almost directly to the consumer, the reservoir capacity being so small that complete settlement of the water cannot take place.

To give you an idea of the amount of mud handled by the pumps of the main pumping station of our water works, it is only necessary to examine the experiments made in 1898 under the direction of the Board of Trustees of the new water works.

These experiments show the following facts:

Maximum amount of mud per million gallons.....	2,333 gallons
Minimum amount of mud per million gallons.....	24 gallons
Normal amount of mud per million gallons.....	230 gallons

Our last annual report gives the consumption of water to be as follows:

Maximum daily consumption	57,803,675 gallons
Minimum daily consumption	23,647,037 gallons
Average daily consumption	43,033,031 gallons

Assuming for the sake of illustration that the greatest amount of mud was contained in the water on the day of least consumption, we have 55,168 gallons of mud delivered to the reservoirs on that day.

Or take the normal amount of mud and the average daily consumption and we find that there is pumped 3,612,524 gallons of mud during the year. This put into one chunk would weigh 25,000 tons, or formed into a cube it would measure seventy-nine feet in every direction. So that you see my disturber is a very formidable object.

You can also see that to get rid of this mud becomes a very serious matter, and I have asked Mr. Bouscaren, the chief engineer of our new water works, how he was going to change our water, which is not alone rich in color but also in substance, into a clear water. He has taken great interest in explaining the plans to me and I repeat the explanation to you.

For a better understanding of the filter system, it will be necessary to give you a brief description of how the water from the Ohio river is delivered to it.

The pumping station is situated on the north bank of the Ohio river about one-half mile above the Little Miami river. The Ohio here forms a pool, the depth of water being no less than twenty feet when the river is at the lowest stage.

The intake tower is on the south bank of the river in Kentucky, close to the pumping stations of the cities of Newport and Covington. A tunnel, seven feet in diameter, sixty feet below the bottom of the river, connects the intake with the pump pit. The water is then pumped to the settling basins, located in the hills back of the pumping station. These reservoirs, of which there are two, have an available capacity of 350,000,000 gallons, I say available, because their contents are considerably greater, but the extra capacity is used to hold the sediment deposited during the settlement of the water. The depths of the reservoirs vary from 31 to 50 feet, the greatest depth being at the dams where a thirty-inch outlet is provided for the purpose of draining and cleaning them.

The valve closing the outlet is located near the dam in the deepest portion of the reservoir and will be opened and closed by hydraulic power. The bottom of the reservoir descends from all points to this valve, thus enabling the cleaning to be done quickly, experience proving that this work should be performed at least once a year.

The water will remain in these basins from 48 to 72 hours, depending upon the condition of the water in the river, and

during this time depositing about 75 per cent. of its impurities.

The settled water can be delivered to the mixing basins from the reservoir at any depth. This is done by means of a floating tube, which can be raised or lowered through a vertical distance of thirty feet by chains operated through a windlass on the dam. The water from the settling basins is discharged into a well and this is connected with the mixing basins. There are two of these basins, one having a capacity of 20,000,000 and the other a capacity of 2,000,000 gallons of water, which will be used at different times, depending upon the condition of the water in the river; the larger one being used when the river is muddy.

As the water flows from the well it passes through a grating made of perforated pipes into a large pipe connected at regular intervals with smaller pipes, which in turn discharge into the mixing basin.

The water as it passes the grating is mixed with diluted alum in portions of one to four grains of alum per gallon, the average being 1½ grains, the amount of the alum depending upon the condition of the water. The alum is introduced through the perforated pipes forming the grating. From the mixing basins the water flows on through the filtering beds, where it receives its final treatment.

The filtering beds will be enclosed and the building can be heated by steam. They will be thirty-six in number and each will be about 50 feet long, 26 feet wide and 8 feet deep. They will be constructed of concrete and the top will be surrounded by a trough, the bottom will be perforated so as to permit the filtered water to be discharged into a pipe and from it to the tunnel leading to another pumping station in the city, about four miles west.

The filtering material, beginning at the bottom, will consist of a bed of gravel eight inches in thickness, the gravel being graded from the size of a walnut to the size of a buckshot, the larger size being at the bottom. On top of this will be a layer of washed river sand three feet in depth. The water will be kept at a depth of about three feet.

Each filter will have a daily capacity of from 2,500,000 to 3,000,000 gallons. The total capacity will be from 80,000,000 to 108,000,000 gallons daily.

The water as it leaves the mixing basins and comes on the filter beds forms a film, this action being due to the combination formed by the alum with most of the suspended matter yet remaining in the water. This film being a mechanical one, is formed at once and forms a coating on the surface of the sand. It is this film which arrests and holds most of such suspended matter which has not combined with the alum and thus completes the purification of the water. So well does it do its work that the effluent will be 99 per cent.

The rapidity of the filtration makes it necessary to clean the filters every eight hours. This operation will consume about fifteen minutes. The cleaning will be accomplished by draining the filter and forcing filtered water and air by means of a pump from the bottom to the top of the filter, the wash water running through the trough surrounding the filter and from the trough the water flows into the sewer. Five per cent. of the filtered water will be used in cleaning the filters.

The amount of the alum to be used will be determined by a careful examination of the water as it comes on to the filter and as it leaves it. This can be quickly done by an examination for turbidity.

The plans here described are based on extensive experiments made in 1898.

The expert engineers' commission of 1896 recommended the English Filter System. Owing to the fact that our water for half the time differs materially in its character from the waters where this method of purification has been successful it was recommended by the Board of Expert Engineers of 1897 as well as by Mr. Bouscaren and the consulting engineers of the present board, that before proceeding further sufficient reliable data should be obtained with reference to the local conditions. In accordance with the above recommendation an extensive experimental plant was erected capable of handling 400,000 gallons per day, and after an expenditure of $40,000 and experiments extending over a period of nearly a year the following general results were found to be true:

That settling for more than seventy-two hours would not be practicable because: First, the fine particles remaining after seventy-two hours' settlement settle very slowly, the percentage of decrease per day being seldom more than 5 per cent. of the original for the fourth day and steadily decreasing thereafter; and second, the cost would be excessive; that even after settling the water for seventy-two hours and removing seventy-five per cent. of the mud, English filters would have worked satisfactorily but 231 days, and therefore these filters were not applicable; that by settling the water, varing in time from forty-eight to sev-

enty-two hours, followed by treatment with alum varying from one to four grains per gallon, the desired purification can be obtained, filtration being at the rate of 125,000,000 gallons per acre per day; that the amount of water required for washing the filter is about five per cent. of that filtered; that if ordinary care be used the amount of acid or alum in the filtered water will be so insignificant as to be harmless.

Finances of New York Water Department.

Mayor Low of New York City indorses the report of the water supply commission. He says in part the following:

The report of the commission contemplates an ultimate enlargement of the city's supply, from the north, to the extent of an additional 500,000,000 gallons per day. It is estimated that this supply, with all necessary aqueducts, reservoirs, filtering basins and pumps, can be procured for $100,000,000 and that it will suffice to supply the needs of the city for the next twenty-five or thirty years.

As bearing upon the possibility of financing this large improvement, I ask your attention to the fact that a constitutional amendment is to be voted upon next November which, if it be adopted, will exempt all water bonds of the city issued after Jan. 1, 1904, from the 10 per cent. debt limitation of the state constitution. The necessity for this exemption was foreseen by Comptroller Coler, and it is due to his efforts, as I understand, that the porposed amendment received the necessary assent of the first Legislature.

When it came up for adoption the second time by the Legislature of last winter, in accordance with the state constitution, it came into direct conflict with another provision of that instrument which provides that whenever any question of expenditure for the enlargement of canals is to be submitted to popular vote no constitutional amendment shall be pending. When the Legislature ordered the submission of the canal question to the voters this year it was at first thought that the pending water debt amendment must fail. A happy suggestion of Corporation Counsel Rives, however, saved the day and averted the necessity of commencing again the tedious process of securing the submission to the people of the amendment desired by the city. He pointed out that the Legislature was entirely at liberty, in approving the proposed amendment, to order its submission at any election which it pleased. The last legislature, therefore, gave its approval to the amendment, and ordered it to be submitted to the people in November, 1904. I need scarcely point out to the city the importance of securing favorable action upon this amendment when it is submitted to the popular vote.

The present annual income from water revenues for the whole city is substantially $9,000,000. The cost of maintenance is substantially $2,600,000; interest, $2,600,000; total, $5,200,000, showing a balance of $3,800,000. There are outstanding, in round numbers, $77,000,000 of water bonds, for all parts of the city. Assuming a sinking fund of 1 per cent. for 50-year bonds, the amount anually required for this purpose would be $770,000. This shows a net profit from the present water works of something over three millions of dollars, on the basis of present earnings. If it be assumed that the money necessary for the new water works can be bororwed at 3¼ per cent., and that 1 per cent. is necessary to provide a sinking fund, a supply more than equal to that now available for Manhattan and The Bronx can be had for an annual charge of $2,550,000. The figures are: Interest on $60,000,000 at 3¼ per cent., $1,950,000; sinking fund provision, $60,000,000, at 1 per cent., $600,000; total, $2,550,000. In other words, the profit, on present earnings from water revenues, would more than pay for the new enlargement up to the extent of 32 million gallons.

The income from water revenues has increased, during the last two years, at the rate of $450,000 to $500,000 per annum. There seems to be no reason why the water revenues should not increase at the rate of $450,000 annually, until the maximum supply is distributed. Every such increase would be largely net profit. It may, therefore, be safely assumed that the new water supply will pay for itself as easily as the present water supply does. It will not only do this, but it will pay, as the present supply would, for the cost of filtration. The commission have not had time to go into these figures as regards the present Croton supply; but the cost of the filter plants is included in the cost of increasing the present supply by the amount of 320 million gallons daily, viz., $60,000,000.

I conclude, therefore, that not only is the need for the enlarged supply immediate and urgent, but also that the new system will be more than self-supporting.

Concrete-Steel Standpipe.

A steel concrete standpipe has just been completed for the water works at Milford, O., which is regarded as novel. It has an 8-inch wall at base, 5-inch at top, 81 feet of water space in hight and is 14 feet in diameter. The standpipe was constructed by J. L. H. Barr of Batavia, Ohio.

PAVING AND PAVING MATERIALS

Asphalt Company of America—Italian Asphalt—Bitulithic for County Roads—Bitulithic in New York City—Illinois Highway Commission—Oshkosh Improvements — Philadelphia Grade Crossings — Illinois River Bridges—Withholding Payment for Construction—Chicago Construction News—Chicago Track Elevation—Joliet Track Elevation—Kansas City Work—Farmers Want Better Roads—Economic Design of Pavements-Street Oiling Specifications.

Stockholders of Asphalt Company of America Assessed $24,000,000.

The largest stock assessment order known to the court records of this country was signed at Newark, N. J., Dec. 22 by Judge Andrew Kirkpatrick of the United States District Court. This order provides for a levy of $24,000,000 upon the stockholders of the Asphalt Company of America. The right of levy is given to Henry J. Tatnall, receiver of the American Asphalt Company, empowering him to collect from each stockholder 80 per cent. of the par value of the stock.

When the company started in business the holders of its $30,000,000 stock paid only 20 per cent. upon their shares of $50 par value each. Judge Kirkpatrick's order provides for the collection of the unpaid 80 per cent.

The order threatens disaster to prominent Philadelphia capitalists who figured prominently in the promotion of the company and menaces hundreds of smaller stockholders who were led into investment by statements of the company's enormous assets and secure monopoly. These assets were grossly exaggerated, while the monopoly was soon broken by ruinous competition.

The successful carrying out of Judge Kirkpatrick's order will mean the loss of millions to P. A. B. Widener, George W. Elkins, George D. Widener, William H. Crocker and the estates of W. L. Elkins and Ludwig S. Filbert. Some of these men were heavy holders of American Asphalt Company stock.

Many of the stockholders of the old company are insolvent and Receiver Tatnall's campaign will doubtless be directed against the promoters and original stockholders.

The present record of stockholders numbers only ten men and the National Asphalt Company, which is alone credited with 598,852 shares. Among these ten men are Gen. Greene with twenty shares and Avery D. Andrews with nine shares. All told, the holdings of those ten men foot up a total of but 1,148 shares, which would make it appear that Receiver Tatnall could call in only $45,920 upon Judge Kirkpatrick's order.

But the receiver intends to prove that the sale of the Asphalt Company of America to the National Asphalt Company was the result of fraud and conspiracy. With this fact legally established the weight of Judge Kirkpatrick's order will fall upon the original stockholders.

Judge Kirkpatrick's decree goes further than the mere authorization of the $24,000,000 levy. It directs that if the receiver shall find among the stockholders any who are insolvent and unable to pay, and that if he believes any former stockholder may in justice be liable for the stock he shall proceed against such stockholder, using the funds of the estate in his hands in an endeavor to collect. This part of the decree covers the 598,852 shares of stock now outstanding in the name of the National Asphalt Company.

The decree provides further that should the receiver be advised by counsel that such recovery cannot be made he shall proceed with such suits upon being indemnified by any interested party for costs and expenses. This opens the way for suits against the stockholders who assigned to the National Company, either by the receiver on his own motion or through him at the request of any interested party.

By this arrangement it is possible for

the individual stockholders who have been vainly seeking to intervene in pending suits to proceed now through the receiver.

According to exhibits filed in the Chancellor's Court of New Jersey P. A. B. Widener is named for 1,296 shares of the American Company stock; William L. Elkins, 7,811 shares; George Elkins, 14,621; George D. Widener, 3,700; Sidney F. Taylos, 6,500; George A. Huhn & Co., 29,450; W. J. Latta, 26,036; Frank A. Barnett, 22,900; Amzi L. Barber, 20,082; Rodman Wanamaker, 33,012; Francis V. Greene, 1,000, and C. C. Harrison, 1,000.

This order is issued because the Land Title and Trust Company asserts that the deficiency due to the trust company as trustee for holders of collateral gold certificates on June 3, 1903, was $29,155,833.35.

If the suits begun against the promoters of the Asphalt Company of America to recover profits aggregating $3,699,220.50 are successful there would yet remain a deficiency of more than $24,000,000.

There is no way, it declared, for the Asphalt Company of America to meet this deficiency but by a call on the stockholders for their unpaid subscriptions.

American Capital After Italian Asphalt Deposits.

It was recently reported from Rome that American representatives were making strenuous efforts to buy the famous asphaltum mines, situated in the neighborhood of San Valentino, in the Mazella mountains.

These deposits of natural bitumen are said to be the largest of this kind in the world. Some ten years ago the mines were bought up by a German syndicate, which since has installed modern machinery and also connected the various mines by means of a narrow-guage railway with the station of San Valentino, on the trunk line Rome-Castellamare Adriatico.

At present six mines in the Mazella mountains are being exploited; the asphaltum appears in the form of rock asphaltum, and the quality is said to be the best known. The annual output of the mines, in which some 500 hands are employed, averages 50,000 tons, the bulk of which is shipped to various countries of Europe, to the United States and to South Africa.

At the station of San Valentino a plant of large capacity, installed with up-to-date machinery, has been erected, where the asphaltum rock is ground into powder or pressed into blocks. The magnitude of the deposits may be gathered from the fact that the mines in two districts alone, namely, in Santo Spirito and Piano del Monaci, are said to contain at least 2,000,000 tons of the valuable material.

Bitulithic Pavement for County Roads.

The Highway Commissioners of Fulton County, Georgia, in which Atlanta is situated, have contracted with Warren Brothers Company for about two miles of bitulithic pavement on county roads in Atlanta. They have rented a plant and purchased bitumen, patent rights and expert advice from Warren Brothers Company, and will do the work chiefly with convict labor.

Bitulithic Pavement in New York City.

In the spring of 1903, when Mayor Low took up the administration of New York City, the attention of the officials was brought to the bitulithic pavement, and it was first investigated by President Cantor of the Borough of Manhattan directing his engineer of highways, Mr. George R. Olney, to investigate the pavement in cities where it had been laid. His favorable report was followed by the investigation of the presidents of other boroughs comprising Greater New York, through their engineers, the reports of all of whom were favorable to the bitulithic pavement, and led the Board of Estimate and Apportionment, composed of Mayor Low and the president of each borough, the comptroller and the president of the Board of Aldermen, to adopt the pavement unanimously for several principal boulevards of New York City, including Seventh-ave., Riverside-drive and St Nicholas-ave.

Representative associations of road users, including the Automobile Club of America, the New York Truck Owners' Association, the Road Drivers' Association of New York, the Associated Cycle Clubs of New York, the National Association of Automobile Manufacturers, the Associated Cycling Clubs of Long Island, the League of American Wheelmen and others, investigated the pavement and they unanimously approved of its adoption.

The first act in obstruction was the appearance before the Board of Estimate and Apportionment of persons claiming that the bitulithic pavement was inferior to asphalt, and that, being a patented pavement, it could not be legally specified under the peculiar clause of the New York charter, as follows:

"Except for repairs, no patented pavement shall be laid, and no patented arti-

cle shall be advertised for, contracted for or purchased, except under such circumstances that there can be a fair and reasonable opportunity for competition, the conditions to secure which shall be prescribed by the Board of Estimate and Apportionment."

Although this provision, which is in no other municipal charter in the United States, has been in the charter of New York City for more than a quarter of a century, it has never until this time been adjudicated, and it offered an unusual opportunity for pressing obstructive tactics.

Specifications for the bitulithic pavement were unanimously adopted by the Board of Estimate and Apportionment for the paving of Seventh-ave. boulevard. The asphalt interests obtained an injunction restraining the award of the contract and the Appellate Court rendered a decision to the effect that patented pavements are not barred out under this provision of the charter.

The Park Department of New York City, desiring to adopt the best form of pavement for paving Seventy-second-st. from Central Park west to Riverside-drive, a street seventy-five feet in width, covering an area of 18,000 square yards, advertised for bids for paving the street, taking bids for sheet asphalt and asphalt blocks as well as for bitulithic. The bid of Warren Brothers Company for its bitulithic pavement was $2.40 per square yard, while the lowest bid for asphalt was the ridiculously low price of $1.15, this price having evidently been made as a final effort to further delay the laying of bitulithic in New York City.

The Park Department, however, did not consider sheet asphalt to be the pavement for this boulevard and recommended to the Board of Estimate and Apportionment the award of the contract to Warren Brothers Company. The Board of Estimate and Apportionment unanimously approved this award, and this result, after two years' stubborn opposition and the bringing of three independent injunction suits in the name of the Barber Asphalt Paving Company as an injured taxpayer, with all delays known to the law in each, probably ends the obstructive tactics which can be employed to prevent the City of New York from adopting any form of improved pavement, whether patented or not, which the proper city officials may determine is to the best interests of the city to adopt.

The bids for the surface paving of the street were as follows: Block asphalt, Hastings Paving Company, $2.23 a square yard; sheet asphalt, Barber Asphalt Company, $1.15; Century Construction Company, $2.20; Sicilian Asphalt Company, $1.80; Warren's bitulithic, $2.40 a square yard.

Illinois Highway Commission Is at Work.

The Illinois Good Roads Commission is sending to all the highway commissioners of that state a circular letter accompanied by a list of questions. These questions are designed to elicit information regarding the highways of the state, with a view to determining the best and most economical methods for their improvement. The Good Roads Commission was created by an act of the last General Assembly for the purpose of investigating "the various problems of road building in Illinois, such as the best and most economical native materials, the best system of road drainage, the best and most practicable methods by which the burden of cost may be equitably distributed among all the people, such as federal, state and county aid, convict labor, etc."

The act provides that the results of the studies of the commission shall be embodied in a report to the next General Assembly with recommendations for legislation on the subject, and it is believed that the latter and list of questions now being sent out will furnish valuable statistical information which will materially aid the commission in its work. The commission is composed of the following: Chairman, DeWitt S. Smith of Springfield; Harold U. Wallace, Chicago; Robert D. Clark, Peoria. The members serve without compensation.

Improvements in Oshkosh, Wis.

A statement has been prepared by G. H. Randall, city engineer at Oshkosh, Wis., showing that about $123,000 has been expended during the year on streets, bridges and parks. The amount expended on street repairs was about $15,000, which is in addition to that expended for new streets.

Philadelphia Wants a Million Dollars to Abolish Grade Crossings.

Both branches of Council of Philadelphia, Pa., passed a revised ordinance Dec. 3 to create a $16,000,000 permanent loan, the principal changes in which are the provision of $1,000,000 to abolish grade crossings and the omission of a similar sum to deepen the Delaware river chan-

nel. To Mayor Weaver is accredited the new item to abolish grade crossings. The loan bill will be voted on in February.

Illinois River Bridges Obstruct Navigation.

All of the bridges across the Illinois river with the single exception of the one at Lacon have been declared nuisances by the War Department. This criticism is the result of an inspection by one of its corps of engineers, in which it developed that the piers on which the draw spans rest are constructed in so faulty a manner as to stand as an obstruction to navigation. Included in this are two city bridges and two railroad bridges at Peoria and eleven others that span the river at other points. The government recommends that lines of piling be driven on both sides of each pier in the shape of a double wedge so that steamboats striking them shall be deflected into the channel. Complaints against the changes ordered will be heard by Capt. Ritchie of the engineering department of the government, at Chicago on Jan. 4.

A New Reason for Withholding Payment for Street Construction.

Application was made to the New York Supreme Court Dec. 4 by the Barber Asphalt Company for an order compelling Comptroller Grout to pay $14,000 for paving Lexington-ave. near One Hundred and Twenty-ninth-st. Comptroller Grout refused to authorize the payment on the ground that a citizen had served notice on him that she had suffered severe injuries by a fall due to the faulty construction of the pavement and she intended suing the city for damages. As the Barber Asphalt Paving Company had given bond for only $7,000, this sum would be insufficient to protect the city from loss if she should receive a large amount of damages. Justice Scott reserved decision.

Chicago Construction News.

The year closes with the cement market somewhat demoralized. Prices are nominally from $1.25 to $1.50, but there is very little business at any figure. It is expected that the action of the Association of Portland Cement Manufacturers in deciding to close down for six weeks or more some time between Jan. 1 and April 1 will put up the price of the eastern cement, but the feeling also prevails that the western manufacturers outside of the association will continue to market their product at present prices and some even anticipate that the figures on the western product will go still lower.

Meacham & Wright have secured the contract from Joseph J. Duffy for supplying 150,000 to 170,000 barrels of cement for the work of the firm at Lockport. The price at which the contract was taken was not made public.

The South Park Commission of Chicago has purchased a fifty-acre tract and another of ten acres for $32,820, which will be used for small parks in the southern part of Chicago.

The local board of improvements is pushing asphalt paving for State-st., between Thirty-ninth and Sixty-third-sts., together with a new system of sewers on both sides of that street. The work will cost about $500,000. The cost of sewers to the front foot of property is estimated at $3.50, and of asphalt paving at $6 to $7.

The corporation counsel of Chicago has rendered an opinion to the City Council holding that a gas company or any other public service corporation has no right to tear up any street that has been paved and is in good condition. It is proposed to notify the gas company of each improvement and if it wants to lay pipes in the thoroughfare it must do so before the improvement is made. If it does not take advantage of such notification the company must lay its pipes under the parkway on either side of the street or else under the sidewalk.

The Municipal Art League recommended at a recent meeting that beauty in lamp-posts should be encouraged by offering prizes for designers, and suggested a competition for fountains and other sculptural decorations intended to adorn street corners. The league also decided to urge more artistic electric light signs for stores and other establishments in the downtown business districts.

Gen. Henry Strong is preparing to erect at the southeast corner of State and Adams-sts., a building to be practically fourteen streets, one above the other, lined with stores, a retail shopping district with the blocks set one upon the other. He seeks to accommodate retail shopkeepers who want stores on State-st., but cannot pay the present high rents. Through the center of each floor will be wide arches, and retail stores will face on these, making each floor practically a street one block long. The build-

ing will be 100 by 145 feet, with caisson foundations and steel work to support seventeen stories if it is decided to add more floors.

At the annual meeting of the Chicago Drainage Board in December the following officers were elected: President, Zina R. Carter; vice-president, William G. Legner. With the cash on hand, the amount of bonds that can still be issued and the unpaid taxes the district has a working capital for the coming year of $5,175,000. The board has adopted plans for the improvement of the north branch of the Chicago river and contracts for the work will be let sometime in January.

Stone dealers have asked the local Board of Improvements to specify that concrete foundations may be of crushed stone, cement and crushed stone screenings.

Progress of Track Elevation in Chicago.

More work was accomplished in Chicago during 1903 in railroad track elevation than in any previous year. In a report to the City Council on Dec. 20 John O'Neill, the city's track elevation expert, stated that 8.25 miles of main track have been elevated, 66.5 miles of other tracks and forty-one subways constructed, and $3,165,250 expended during the year. He says:

The different railroad companies commenced the work of elevation this year in the month of May, and since that time have placed upon their right-of-way over 2,000,000 cubic yards of sand filling and built over 84,500 cubic yards of retaining and abutment walls of concrete masonry. They have eliminated forty-one grade crossings, all of which are open to traffic though not fully completed. When completed these forty-one subways will be spanned by over 234 iron bridges sixty-six feet in length and weighing about 1,700 pounds per running foot. The work of track elevation has given in all its ramifications employment to over 15,000 men this year, all the expense of which has been borne by the railroad companies. The amount paid by the city has been only the expense of the department office. The appropriation for this department has been $6,000, of which amount there will be a small unused balance.

The work of the Chicago & Western Indiana railroad and its tenant lines is considered the most important work of the year. Regarding this he says:

This elevation was commenced on May 14 last and since that time they have placed under the seven tracks from 150 to 170 loads of sand daily, averaging thirty cubic yards to the car, or nearly 750,000 cubic yards of sand. The embankments composing this elevation are supported on the sides of the right-of-way by heavy retaining walls of concrete masonry. This company has also elevated its freight yards between Sixty-fourth and Sixty-sixth-sts., a distance of 1,320 feet, and between the west line of the right-of-way and Armour-ave. At Sixty-third-st. it has constructed a stone depot, which is reached by carriages on a terraced driveway running from the north line of Sixty-fourth-st. up to the elevation of the depot. This piece of elevation is not quite completed, but will be nearly completed before the end of the year. Under this ordinance the company has elevated two miles of main tracks and about seventeen miles of other tracks, eliminating seventeen grade crossings by subways, at an estimated cost of about $2,000,000, $325,000 of which was expended in 1900 in the construction of retaining walls and foundations for the abutments.

Ordinances have been passed and accepted by the different railway and railroad companies this year for the elevation of their roadbeds and tracks as follows:

Miles of main tracks	6.0
Miles of other tracks	26.5
Subways to be constructed	44
Estimated cost of entire work when completed	$2,400,000

Work of elevation done this year was as follows:

Miles of main tracks elevated	8.25
Miles of other tracks elevated	66.5
Subways constructed	44
Cost of entire work	$3,165,250

Ordinances passed by the City Council and accepted by the railroad companies for the elevation of their tracks from May 23, 1892, to Dec. 31, 1903, cover the following amount of work:

Miles of main tracks to be elevated	138.10
Miles of other tracks to be elevated	709.95
Subways to be constructed	537
Estimated cost of entire work when completed	$43,540,250
Estimated cost of work yet to be completed	$18,095,000

Joliet Track Elevation.

The City Council at Joliet, Ill., has directed City Attorney McKeown to prosecute all suits against all railroads for violations of the track elevation ordinance.

Street Work in Kansas City.

The report of Emmet King, secretary of the Board of Public Works at Kansas City, Mo., shows that during the three months ending Oct. 20, 153 contracts for grading, paving, curbing, sidewalks and sewers have been completed at a total cost of $324,157.85. The distribution of expenditures was as follows:

	Miles.	Cost.
Street paving	2.35	$ 83,614.40
Paving alleys	0.18	2,997.34
Asphalt repairs	4.20	10,822.61
Street grading	6.38	40,483.56
Grading alleys	0.99	1,500.29
Artificial stone curbing	6.11	12,568.74
Curbing and guttering	1.31	5,663.55
Artificial stone sidewalks	8.02	33,835.40
Natural stone sidewalks	0.08	453.96
Brick sidewalks	0.18	579.84
District sewers	3.24	127,085.29
Repairs, sidewalks and curbing	....	274.75
Work paid by vouchers	....	798.63
Work paid by appropriations	....	324,157.85

Indiana Farmers Want Better Road Law.

A resolution was adopted at the Allen County Farmers' Institute, which was held at Ft. Wayne, Ind., Dec. 2, declaring that the farmers of Allen County favor "such a revision of our present road laws as will secure the construction of permanent macadamizing." Also, that the Senators and Representatives of Allen County be requested to give the matter the attention necessary to secure the proper legislation.

The Economic Designing of Pavements.

By A. W. Dow, Engineer Department, District of Columbia.

(A paper before the League of American Municipalities at its convention in Baltimore.)

In presenting to you a paper on Paving, I am impressed with the fact that there is less known about this branch of municipal engineering than of any other, or I put this differently and say that we have still more to learn about this branch than any other. We are really only now finishing the foundation of our education in this industry. Strange as this may sound to you in the light of the enormous amount of paving that has been done in this country in the past fifteen years, yet it is so, for our present method of paving is nearly entirely lacking in system and science. We make little or no study of the conditions that the pavement has to meet in its existence, and do not make sufficient distinction in the class of pavements for different streets and different localities.

Before going further I would beg your indulgence for following the much-used path pursued by writers on this subject, that is, of making some remarks on the ancient history of the subject, and call your attention to the pavements or roads built by the ancient Egyptians, Carthagenians and Romans. It is not, though, for the purpose of presenting these old pavements as examples, or of extolling the methods employed in their construction, but only for the purpose of illustrating more forcibly the character of the problems in this industry that we have to deal with at the present day. Our attention is often called to these ancient roads, to their marvelous life and endurance, and by some, to the fine engineering displayed in their construction. But in the light of intelligent engineering this last is greatly overdrawn, as there is no good engineering displayed in the construction of these pavements, and they they are only monuments to an extravagant waste of labor and material and examples of methods that we want to avoid. It does not require an engineer to build a structure that will endure if the builder is allowed an unlimited amount of material and labor. The skillfully constructed work is that which is an economic combination of good properties supported by a strength having a sufficient factor of safety.

There is nothing that better illustrates the difference between the ancient and the modern pavements than a comparison of the ancient and modern civilization. In the early day of civilization the welfare of man was entirely dependent upon his strength, his capacity to overcome and resist things with brute force. The successful man in those days was the one that could wield the heaviest club or sword and bear the heaviest armor. All other qualities were sacrificed to the building up of strength and endurance, and so it is with the ancient pavement constructed of huge stones or masses of masonry, in many cases six feet in thick-

ness, built solely for the purpose of endurance and resisting traffic through its brute strength, built with no purpose in view other than that of resisting. In our modern times the man with strength alone counts for little. The most successful man is the one in which various desirable traits are governed by a good intellect, and the whole frame supported by a sufficient bodily strength to insure health, even under an excessive strain of mental energy. And so it should be with the modern pavement. It should be an economic combination of many good properties, sustained by a strength sufficient to maintain it under the maximum strain to which it may be subjected during its existence. As the training of the modern man is studied and planned so as to produce a combination of faculties that will serve him best in the profession he is to follow, so should the pavement be studied that is to pave a certain street.

We must free ourselves from the barbaric methods of building pavements, that is, of putting down some material that we think will be the most durable, irrespective of whether it answers any other purpose or not, and also of a method so much in use today of paving every street with the same class of pavement, irrespective of whether the conditions of the street are suited to that pavement, or even suitable to the materials used in its construction. This last practice we cannot hope to do away with until we have abandoned our present method of selecting pavements from the bargain counter of competitive bidding. This method of selecting pavements that is now in vogue with the majority of municipalities, would not be countenanced in any other business, and until we have learned how to select pavements that will best meet the requirements of the street to be paved, we cannot hope to pave our streets economically and well. What would we think of a firm who made a business of the use of sheet metals for various purposes, such as roofing, tank lining and sheathing vessels, etc., if they should get out a specification and ask for bids for sheet metal, irrespective of the quality of the metal, and that when the bids were received they are found to be for sheet tin, copper, lead and zinc. The sheet tin is the lowest bid, and for this reason is accepted, using it in all classes of work, irrespective of conditions. It is found to answer some purposes very well, while for others it is an utter failure.

Can anyone consider that an economic way of doing business? That the selecting the kind of pavement and even the kind of material to use in the same class of pavement is necessary is demonstrated each day to anyone who makes a careful study of the wearing of different pavements. It is a common occurrence to find two pavements laid at identically the same time, under the same specifications, and with the same materials, and with apparently the same amount of traffic on both streets—one pavement gives a most excellent surface, costing practically nothing for repairs for over ten years. The second pavement begins to act poorly in two or three years, and by five years it is in need of extensive repairs. What has caused the difference in these two pavements, both laid in identically the same manner? It is evident that this difference is the result of some physical condition existing in the second pavement that does not exist in the other, and that if it is possible by any means to change the conditions so that they will be identical in both pavements the one will last as long as the other. If, on the other hand, it is found that the conditions cannot be changed economically, it shows conclusively that another class of pavement not injuriously affected by that condition should be selected for the paving of that particular street.

In other words we must learn to study thoroughly the characteristics of the various paving materials, and classes of pavements, what physical conditions in the streets act detrimentally on one class and not on another, and what physical properties it is desirable for the pavement to have to be the best suited for the class of traffic and the comfort of the property owners of the street under consideration. We should treat the paving of streets in a similar manner to the educating of men. We must study their adaptability and endeavor to develop them in the line which, after careful study, we conclude they will best be adapted to. As some men will make utter failures in some professions, and be most successful in others, so it is with pavements. Under certain conditions some pavements give excellent services, while under others they prove dismal failures. And how often is an entire class of pavement condemned because it has failed from conditions under which we laid it. We never take into account the fact that in other cities this same class of pavement has proved a great success. It is seldom that a careful study is made of the cause of failure in one case and success in the

other with a view of determining the difference in the conditions that were responsible for the success and the failure. It is owing to this that we have some cities going so far as to pass ordinances prohibiting the use of certain classes of pavement, while others are using the same with marked success and economy. This has done much to retard progress in paving.

The necessity of a study of conditions and factors is well appreciated and recognized by such authorities on paving as Tillson and Baker, as both these authors give tables in which they assign figures to represent the value of different factors such as cheapness, durability, ease of cleaning, ease of traction, foothold, ease of maintainance, favorableness to travel, sanitariness, etc., but these tables and their discussions are principally adapted to differentiating between the different classes of pavements, and do not emphasize the necessity of studying the effects of existing physical conditions on the different materials entering into the composition of the pavement, and also upon its physical construction. Such factors should be discussed under the heading of durability. Their existence is recognized by Tillson, for he says " Durability, too, is affected by so many varied conditions that it is discussed with difficulty." But pavements should not alone be studied during their manufacture and laying, but should be watched carefully during their entire life, and careful record kept of all failure and the probable cause.

The question now naturally arises as to what is the most satisfactory and economical result in paving. The methods of contracting for paving that are in general use at the present day, and especially that branch of the contract that relates to the guarantee have been so ably discussed before the American Society of Civil Engineers by Messrs. Hazelhurst, Whinery, Lewis and others that it would only be repetition on my part to undertake to discuss in full these methods, so I will only call your attention to a few essential points, and advise all who are at all interested in paving to read these most instructive papers in the transactions of the American Society of Civil Engineers, Dec. 1902.

The method in most general use today is to draft specifications going considerably into the details of the construction of the pavement, and specifying more or less fully the kind of materials and the methods of manufacturing the materials entering into its composition. The contract requires that the contractor shall guarantee all work and keep same in repair without expense to the municipality for a stipulated term of years, the most common period being five years. The method adopted by cities for protecting guarantee is to retain a ceretain sum of money, say 10 per cent., from the original cost of the pavement.

Another method is to have the contractor give bond, guaranteeing the fulfillment of the guarantee. Possibly the most serious objection that has been pointed out in such specifications is requiring the contractor to guarantee that his pavements be kept in good repair for a certain term of years. As has been justly remarked on this point, where are we to draw the line between the paying for the pavement and the keeping of it in repair? Would not the property-owners in such a contract be justified in complaining that they were paying for maintenance of the pavement when such work is chargeable to the city, and, as pointed out by Mr. Whinery, is it justice for property-owners on a heavily traveled street to pay more for the identical pavement than property-owners are paying on a lightly traveled street? With a time guarantee even as short as five years there is the danger that the paving company or its bondsmen may fail to make good the guarantee, and the pavement be left in a poor condition with repairs necessary at the expense of the city.

Another objection which applies to any guarantee system is the question in what condition should a city expect its pavements at the expiration of its guarantee? This will always be a bone of contention between the city and a close contractor. An objection to the present method of operation under this class of specifications is that considerable detail is given as to the methods of laying the pavement, and of producing materials, and that as yet there is hardly a city that has such an inspection as to know whether these specifications are carried out. Under these circumstances the entire performance of the work on the pavement is left to the contractor, and is largely dependent on the foreman he employs, both in the manufacture of the pavement and the laying of it. Such reliance without a thorough inspection is dangerous, and in a number of cases has proved disastrous to the city. A contractor very naturally desires as large a profit as can be obtained from any piece of work, and his foreman works with that end in view. He is frequently rushed and takes chances in the manipulation of the material and

the laying of the pavement, and his experience has taught him that good results are often obtained by cheaper and quicker methods than those in the specifications. He is naturally led to believe from this that such great care as is specified is not necessary for the production of good work, and he will then make such changes in the manipulation as he thinks will either be a saving to his employer, or produce a good record for himself of laying more pavement with less expenditure of money. But let me add that he is often justified in following his own methods, as those of many specifications if closely followed would result in poor work.

Another objection that may be raised to the technical part of such specifications is that the same class of pavement is asked for for every street. The contractor and possibly even the city is not aware of the physical conditions existing on these streets, and yet the contractor bids and guarantees to lay the same pavement on every street alike.

Another method of letting contracts that is in use by some cities and which especially does away with the objections which are raised to the long-time guarantee is that the city pay a certain sum for the pavement, and require in the specifications that after five years the contractor is to keep the pavement in repair for a certain period, for which he will be paid a stipulated sum per square yard. This likely in some cases is an advantage over the first method mentioned of contracting for paving, but it, too, is open to objections, which have already been reviewed and discussed in the papers before mentioned.

Some cities at the present time are undertaking to do their paving on the municipal plan. This, I believe, in some cases, will prove very advantageous and economical to the municipality, but a careful study should be made of conditions before a city adopts this method of paving. In the first place they should consider whether the amount of paving which they do in a year is sufficient to warrant their erecting a plant; for how long each year this plant will be working, and if not constantly, will it be economical to retain the men employed in its running? If the men are discharged at the completion of a piece of work, will it be possible to obtain others to fill their positions when any new paving is to be done? One serious objection to municipal construction, especially where the city is small, and only has sufficient paving to keep its one plant well employed, is that after the city has invested in its paving outfit, and its force has been trained, it will naturally be restricted to only that class of pavement for which they have been equipped. Another objection which a number raise to municipal construction is that it will give an opportunity to politicians to secure places for their constituents, irrespective of their suitability for such positions, and such men are not likely to produce good work. It appears, however, that all serious objections to municipal construction are dependent upon conditions and without doubt many cities could devise methods that would be economical whether these methods be entirely or partially carried on by the municipality.

There are three methods which I believe might prove desirable for municipalities to construct pavements. One of these, which I have just discussed, is that of municipal construction. If a city does sufficient paving during a year to keep a plant and pavers occupied, either at laying new pavement or repairing old, and their government is such that politicians will not enter into the selection of the skilled laborers necessary to the performance of this work, paving can, without doubt, be done very economically. Before a city adopts this plan it should be sure that it has a man in charge of the work who is not only competent to lay good pavements, but of being able to study the different factors and physical character of the street to be paved.

Another modification of the method would be for cities to hire a paving plant and gangs of men from contractors, the city furnishing all or part of the material to be used in the production of the pavement. Of course this plan is open to many modifications depending on how much work the city would do, and how much material they would furnish or require the contractor to furnish. By laying pavements under the municipal plan, or by the modification just suggested, the city has the advantage of being able to discriminate between different materials to meet the conditions of the various streets under construction.

The method which I believe would be the most generally advantageous is for a city to employ a man who is competent to take entire charge of all branches of the paving, and a sufficient force of inspectors under him to see that all the work is performed as required. The specifications should be drawn up in detail, but with a view to allow him to use his discretion

where conditions require a change from the detail of the specifications. The contract should only require that the pavement be guaranteed for two years, by specifying that any defective workmanship or material which might develop during the guarantee period should be immediately made good by the contractor. By this means the objection made to to the 5, 10 and 15-year contract system, especially when paving is paid by assessing the abutting property-owners, that the property-owner is not a'one paying for the construction of the pavement but for its maintainance, would be overcome.

Such a system would make possible a thorough examination of the character of all streets to be paved and the selection and use of only that class of pavement that is best suited to the conditions of the several streets. It, of course, goes without saying that with a thorough inspection the city will obtain far better work in paving and besides it will correct an evil that is so prevalent in the paving business today, which is responsible for much bad paving and for which many cities will have to pay dearly for in repairs and defaulted contracts in the future. I am speaking here of the competitive bidding that is carried to such a pass that it is hardly possible for a contractor to make any money if he is held to the requirements of the specifications.

I will not attempt any detailed description of how such a method could be carried out in a paper such as this and then it is more than likely that the detail would vary with the conditions met with in different cities, but I believe they will be found to be the simplest of any of the systems in vogue at the present time.

It is evident that whether the paving be done by municipal construction or by the two-year guarantee system, the work must be in charge of a competent man, one who is especially trained in this line. It is to be regretted that there are so few such men, and that the science of paving is so overlooked and neglected by our technical institutions. Should there be a demand for men making a specialty of this subject our institutions would not be long in giving courses which would meet the demand.

It has been my object in this paper to point out to you how lax our present methods of treating the paving question are, and the necessity of considering it more scientifically from all points of view. That the industry is too extensive to be so lightly treated may be the better appreciated when you consider that in the twenty-five years preceding the year 1900, 120 cities spent approximately $75,000,000 in first cost of asphalt pavements alone. True, this class of pavement has been the most popular, but it would be safe to estimate from these figures that during the time there was much over $100,000,000 spent for all classes of so-called improved pavements. It is estimated that New York City alone will spend over $4,000,000 per annum to keep the present paved streets of the city in condition. I do not believe that I am far from right in saying that there will be over 8,000,000 square yards of pavements laid this year in the United States at a cost of $15,000,000, and how much study and forethought is given to all this work, and to what extent are the specifications being adhered to?

That we are not getting today what our specifications call for in all cases is evidenced by the low prices some cities are paying for pavements. It is certain that if a contractor is to be paid a price less than what it will cost him to lay a pavement under a specification he will shirk his work in some way so as to make some profit, for he is not in the business for philanthrophic motives. It is just a year ago that this society was addressed on the subject of paving by Mr. Fendall of this city, when he advised a combination of the different cities for the purpose of reducing the price of pavements, but I believe a more advisable plan would be to combine more for the purpose of regulating the prices to pay for pavements rather than to lower it. A contractor is surely entitled to a price that will insure him under average conditions a fair profit. The lesson must be learned that a cheap pavement is not generally the most economical, and only by a reconstruction of our present methods can we hope to secure a satisfactory system of paving.

Street Oiling Specifications at Bakersfield, Cal.

The city of Bakersfield has adopted the following specifications covering the construction of oiled streets:

First—The street, after being graded in accordance with specifications for grading streets in city of Bakersfield, will be ready to receive the oil.

Second—The quantity of crude mineral oil to be applied shall be at the rate of one and one-half gallons of oil per square yard of surface area or street.

Third—The oil shall be 12 to 14 Baume gravity and containing not over 2 per

cent. of water and heated to a temperature of not less than 200 degrees Fahrenheit when being applied.

Fourth—The oil shall be applied as follows: The street shall be plowed to a depth of six inches, then be coated with oil at the rate of one gallon of oil per square yard of area; then the oil shall be plowed under to a depth of four inches and then harrowed with a disc harrow, or rolled with a Fitzgerald spike roller; then a second coating of oil shall be applied at the rate of one-half gallon of oil per square yard of surface area of street. The street shall then be harrowed or rolled with the Fitzgerald spike roller till the oil becomes thoroughly incorporated with the surface material of the street. Then the street shall be rolled till sufficiently compacted to withstand ordinary traffic without rutting.

Fifth—When accepted the street shall be on the established grade, having a true and even surface and crown.

Sixth—The contractor shall furnish all material and appliances necessary for the prosecution of the work to completion in a thorough and workmanship manner.

Seventh—Bids shall state price per barrel (42 gallons) of oil app'ied on street according to the method prescribed in these specifications.

Eighth—The work shall be performed under the superintendence and to the satisfaction of the street superintendent and city engineer.

Ninth—The Board of Trustees reserve the right to reject any and all bids.

The specifications were adopted as prepared by City Engineer Evans.

ELECTRICITY

Erie Municipal Conduits—Electric Light Statistics—Electric Shocks from Fire Streams—Construction and Maintenance of Electric Wires.

Municipal Electrical Conduit System in Erie, Pa.

During 1898-9 the city of Erie, Pa., constructed 137,300 linear feet of ducts for electric wires underground and has since added 22,083 feet, making a total at this time of 159,383 feet constructed and in use. The total cost, including the expense of connections, poles, cross-arms, guy wires, iron pipe on poles, manholes and castings therefor, repairing over trenches on paved streets, etc., complete was $18,056.75.

Of the space in the ducts 19,372.5 linear feet is occupied by the N. Y. & Pa. Telephone and Telegraph Company, 18,633 feet by the Mutual Telephone Company, 10,134 feet by the Western Union Telegraph Company and 8,296 feet by the city fire and police signal system.

The revenue derived from the use of the conduit for the year ending April 3, 1903, was $2,378.41. The total revenue received to Sept. 25, 1903, was $6,738.71.

We are indebted to B. E. Briggs, City Engineer, for this information.

Electric Shocks from Fire Streams.

One of the objections to the erection of electric wires on poles in cities is the hindrance which such wires offer to free access to a burning building by means of ladders and fire towers. It is at times also necessary to cut such wires to afford access to a burning building—a work which is not highly appreciated by the fire fighters. Another difficulty presents itself also, namely, the danger to the firemen from electric shocks due to currents carried to the nozzle by the stream of water when it comes in contact with live wires. Such shocks have more than once been of sufficient strength to disable firemen for a time, but, so far as is known, no fatalities due to this cause have occurred. In order to ascertain to what extent firemen are subject to risk of life, if at all, when the stream of water thrown from the hose strikes against live wires a series of experiments were recently undertaken in Germany. They were made with pressure of 6,000 volts alternating current and 550 volts direct current. The stream of water was directed against a portion of the wires from which the insulation had been previously removed. With the 6,000 volts pressure it was found that the resistance of about one foot of ordinary hydrant water reduced the potential of the current to a point when it was not dangerous, but the effects were not pleasant. When the resistance of the water was lowered by the addition of 0.05

STATISTICS ELECTRIC LIGHT OF SIXTY-FOUR SMALL CITIES.

Compiled by M. W. Mix, Mayor of Mishawaka, Ind.

	Population, 1900.	No. of Street Arcs.	Cost of each per year.	Schedule.	Meter rate per K. W.	Cash discount.	Ownership.	Investment.
ILLINOIS.								
Belvidere	7,000	105	$65.00	M. L.	20c	25%	P	
Centralia	8,000	72	72.00	M. L.		5%	P	
Dixon	8,979	75	80.00	M. L.			P	
Harvey	5,000	96	60.00				P	
Macomb	5,375	§114	72&96	M. L.			P	
Mattoon	9,662	132	48.00	A. N.			M	$25,000.00
Monmouth	8,252	107	66.00	M. L.	20c	25%	P	
Mt. Vernon	6,000	52	65.00	A. N.	10c	20%	P	
Paris	6,105	102					M	25,000 00
Pekin	8,460	108	65.00	M. L.	11c	5%	P	
Urbana	5,728	74	75.00	M. L.	20c	25 to 50%	P	
INDIANA.								
Alexandria	7,300	53	90.00	A. N.	8c	None	P	
Bedford	6,115	70	80.00	A. N.	None	"	P	
Bloomington	7,000	73	80.00	A. N.	10c	"	P	
Brazil	8,000	101	62.40	M. L.			P	
Columbus	10,000	83	46.50	M. L.			M	10,000.00
Connersville	6,836	90	75.00	A. N.	15c	5%	P	
Crawfordsville	6,649	143	60.00	A. N.	12½c	None	M	100,000.00
Frankfort	7,100	121	60.00	A. N.	7½ to 20c	"	M	75,000.00
Greensburg	5,700	87	75.00	M. L.	None	"	P	
Hartford City	6,789	120	80.00		10c	"	P	
Jeffersonville	11,000	127	46&54	A. N.			P	
Kokomo	10,960	119	70.00	A. N.	10 & 12c		P	
Mishawaka	5,560	76	65.00	M. L.	11c	None	M	
Mt. Vernon	7,000	74	69.75	A. N.			P	
Peru	9,000	87		A. N.			M	60,000.00
Wabash	8,618	28	76.00	A. N.	12, 10 & 8c		P	
Washington	10,000	144	70.75	M. L.	None		M	75,000.00
MICHIGAN.								
Adrian	9,654	*112	64.80	A. N.	14c	None	P	
Benton Harbor	6,532	*50	72.00		14c	5 to 50%	P	
Coldwater	6,216	81	60.00	M. L.	10½c	10, 15 & 20%	M	45,194.88
Holland	7,790	64		A. N.	8c		M	80,000.00
Ionia	5,000	60	75.00	M. L.			P	
Ironwood	9,705	63		M. L.	8c		P	
Ludington	7,166	49	65.00	M. L.			P	
Monroe	6,200	86	51.00	A. N.		5%	M	25,268.00
Owosso	8,986	†120	65&95		15c	5%	P	
Pontiac	11,000	136	57.60	M. L.	15c	5%	P	
Ypsilanti	7,000	120	29.80	M. L.			M	18,000.00
OHIO.								
Bellefontaine	6,649	90			8½c	None	M	20,000.00
Defiance	8,000	80	75.00			5%	P	
Delaware	9,000	134	77.00	D. H.	10c	None	P	
Galion	7,282	109	72.00	M. L.	10c	"	M	42,000.00
Gallipolis	5,432	65	64.50	A. N.	Not used	"	P	
Glenville	5,558	42	82.92	A. N.	None	"	P	
Greenville	5,501	100	78.00	A. N.	15c	"	P	
Kenton	6,852	110	75.00	A. N.	10 to 25c	"	M	125,000.00
Lancaster	8,991	105	85.00	A. N.		"	P	
Middletown	9,215	111	84.00	Sun	10 to 20c	10%	P	
Mt. Vernon	6,663	110	69.00	A. N.	None		P	
Niles	7,490	*66	75.00	D. H.	10c	None	M	70,000.00
Norwalk	7,074	105	70.00	Mid.	12c	10%	P	
St. Marys	5,359	73	50.00	M. L.	10 to 15c	None	M	33,500.00
Sidney	5,688	75	75.00	A. N.	9c	"	P	
Tiffin	10,989	160	80.00	A. N.			P	
Van Wert	6,422	70	76.55	M. L.			P	
Wellston	8,045	100	70.00	M. L.	10c	40%	M	40,000.00
Xenia	8,696	113	63.00	M. L.	15c	None	P	
KENTUCKY.								
Bellevue	6,632	62	75.00	M. L.			P	
Bowling Green	10,000	90	50.00	A. N.			M	25,000.00
Frankfort	11,464	108	96.20				P	
Henderson	15,000	174	50.00	A. N.	5c	None	M	60,000.00
Hopkinsville	7,280	70	83.33	A. N.	10c	"	P	
Winchester	7,000	*68	80.00	D. H.	15c	"	P	

M. L. moonlight; A. N. all night schedule; P. private; M. municipal ownership.
*1,200 C. P. †1,600 C. P. §1,600 and 2,000 C. P. ‡2 A. M.

per cent. of soda, the minimum safe length of the stream was increased to about 40 inches. With 550 volts direct current a dangerous voltage was not reached with pure hydrant water, but with the same percentage of soda in the water harmful potentials were indicated by the volt meters used in the tests when the stream of water was only three inches long. On the whole the results of the experiments showed that the danger to firemen from the contact of water from the hose with live wires carrying high potentials is not ordinarily so great as has been generally supposed hitherto. This, however, is no reason for lessening the precautions looking to the safety and best interests of all concerned in this matter.—Cassier's Magazine.

THE DIRECTORY OF AMERICAN CEMENT INDUSTRIES

The rapid and great development of the cement industries demands a third edition of the "Directory of American Cement Industries," which will be issued early in 1904. It is the only complete representative of the cement trade in all its branches, and consequently there is an increasing demand for it which makes frequent editions necessary. Advantage is taken of the opportunity to revise and improve the book each time and these improvements will be specially notable in this third edition.

The expansion of the directory features has been so great that the Hand-Book is now bound separately and can be obtained either separately or in combination with the Directory or with Municipal Engineering Magazine.

The enormous expansion of the manufacture and use of cement shows itself in every department of the Directory.

Thus in the list of Descriptions of Works, the second edition had 240 entries, while the third edition will have about 360 entries, an expansion of 50 per cent.

The new works which are in operation are fully described, which makes a considerable addition to this most valuable section of the book. There have been so many additions to the older factories, so many of them have been rebuilt, and they have added so many new plants to their existing works, that this whole chapter has been rewritten, scarcely a single description remaining the same in all particulars as in the earlier edition. Part of this rewriting is due to the recognition by the managers of cement plants of the fact that an accurate description of their works and product in this book is of direct benefit to the reputation of their brands of cement, so that a few who have heretofore withheld information are now ready to supply it in full.

As a consequence of this rapid development of the industry there have been many abortive attempts to organize companies, there have been many combinations, and there have been some abandonments of old-fashioned plants. The list is therefore divided into two parts, the first giving the names and descriptions of existing plants, of those under construction, and of those companies which are in process of establishment or of formation. The second part of the list gives all the names which at the date of issue have dropped out of the business world, either from change of name, from absorption by other companies, from failure and liquidation or from abandonment before actual construction had begun. This second list will be of considerable value, though not having the indispensable nature of the first list.

Following the descriptions of works will be given the list of companies which are in existence with locations of offices and works, names of all officers and directors, and sales agents, capitalization, capacity, names of brands of cement manufactured and their kind and the transportation routes available. For convenience of users of the book this list is separated from the list of descriptions of works and will be found to be a full and concise business directory of all the manufacturers of Portland and natural hydraulic cement, giving all the information, except as to process of manufacture, which is obtainable.

The names of brands given in the above

list are collected in a separate list, arranged alphabetically as names of brands, each name accompanied by a statement of the kind of cement, the name of the manufacturer and of the general sales agents handling it, thus giving in a convenient form just the information about a cement brand which is wanted and referring to the lists of cement manufacturers and descriptions of works for greater detail.

The names of general sales agents are also collected from the list of manufacturers into an alphabetical list, giving names and addresses of agents, names of companies for which they act and of brands they handle.

The importance of the import trade during the past year and the slowly growing importance of the export trade lead to a considerable improvement in the section devoted to the foreign cement trade, in which will be found the names and addresses of the principal manufacturers of cement in foreign countries and of the brands of cement which they manufacture. The improvement in this list, especially as regards German and French manufacturers, is marked and it gives all the information which is called for by our correspondents at this time upon the subject of foreign cements. A few descriptions of foreign cement works are given to show the differences in processes of manufacture from those which have been developed so recently and so originally in America. Like all the other departments in the Directory this one aims at giving all the commercial information which can be desired at this stage of the development of the cement trade, and, in fact, more than is required.

The list of dealers in cement is considerably increased, and has been thoroughly revised so that it represents completely the cement trade in all cities in the United States of 2,000 population or more and of some others, very few cities indeed having failed to respond to our requests for the latest information. The manufacturers of and sales agents for cement are listed under their appropriate postoffice addresses so that this list serves also as a geographical list of factories and distributing points.

The rapid extension of the use of cement has caused a large addition to the number of contractors using cement. Although there are many changes each year in the contractors and it is necessary to eliminate many names of those who have failed or who were in the business but temporarily, there is a very large increase in this list, which is estimated at 50 per cent., though all the returns are not yet in. The list includes all contractors, workers in cement and large users who do their own purchasing of cement. The value of the rating feature, introduced in the second edition, has been recognized and it is now possible to tell from the list how much cement within certain defined limits a contractor uses. Practically all of those not showing the rating for cement used consumed less than 500 barrels a year.

There is a considerable addition to the list of engineers, architects and other supervisors of the use of cement, for the same reason given for the increase in number of contractors. These men make the specifications for the use of cement and have considerable advisory power over the selection of brands of cement to be used on their work.

The list of laboratories and engineers making analyses and tests of cement and cement materials and of engineers who design cement plants has been thoroughly revised, and so have the lists of makers of and dealers in machinery and supplies for cement plants and for cement users.

The valuable credit rating feature introduced in the second edition has been improved and extended for the third edition. The recognition of its value has led many more to respond to requests for information upon which to base the ratings quoted and they will be found fuller and quite as reliable as those given in the first edition. The feature is one which was expected to be of slow growth and the publishers of the Directory are much gratified at the rapidity with which it has received recognition and the alacrity with which information is furnished.

The table of freight rates has been revised and extended to suit the increase in the factories in operation and is still worth many times the cost of the book to those purchasing or selling quantities of cement, large or small. The evidences of saving in money on account of intelligent consultation of this table come to hand frequently.

A new feature of the book is an outline map of the United States showing by appropriate marks the location of cement plants in operation or proposed, the difference being shown by differences in symbols. This is an interesting exhibit, especially to those who are considering the establishment of new cement plants.

In conclusion it may be said that the third edition of the "Direcory of American Cement Industries" will be a material improvement and extension of the previous editions and that it will continue to represent the enormous advance in the trade as completely as its predecessors.

MUNICIPAL AND TECHNICAL LITERATURE

Municipal Reports.

Municipal Reports.

Receipts and Expenditures of Ordinary Revenue of Boston, Mass., 1898-1902. Special Publication No. 9. Statistics Department.

This is one of the occasional publications additional to the regular monthly bulletin of the Boston City Department of Statistics, and shows the receipts and expenditures of the city for the years named, so separated and arranged that comparisons can be made of various items from year to year. Analyses are made by departments and by funds under each department, so that almost any desired detail short of individual vouchers can be found. If more cities made such publications as this there would be greater economy in many departments, for leaks could be more readily traced.

Appendices give the financial statements of the last two or three years in the uniform form proposed by the National Municipal League, and show the advantages of this form of making annual reports.

A Repair Plant for Asphalt Pavements for the Borough of Manhattan. Recommended by George Livingston, Commissioner of Public Works. With an appendix embodying the result of an expert investigation by James C. Bayles. Made to Jacob A. Cantor, President of Borough of Manhattan, New York City.

This report outlines a plan for municipal plants for repairing asphalt streets, including seven section stations in Manhattan. The recent grand jury recommendation of an asphalt repair plant owned by the municipality is set forth in detail, with tables of number, length and area of street openings each year, aggregating nearly fifty miles of trench. Arguments are made against the present system and for the direct responsibility of the city for present conditions, closing with a recommendation of the appropriation of $100,000 for a municipal asphalt plant.

Mr. Bayles's report goes somewhat more into detail in his arguments along the same lines. He states the terms of the present repair contract by which concrete costs $6 a cubic yard, binder costs $1.52 a square yard and wearing surface costs 45 cents a square yard. He favors a short period of guaranty, only sufficient to develop bad materials used in construction or errors in manipulation. He shows that there are now no trade secrets in asphalt manipulation, that there are plenty of men of skill and experience to be secured, that machinery and tools are on the market, that there are many independent sources of suitable asphalt and that there are no basic patents on asphalt mixtures. He believes that the cost of the work under municipal operation will compare favorably with that by contract.

The estimates of cost of plants are given in detail, amounting to about $30,000 for the central station on the river front for receiving and preparing materials for use and $2,500 each for steam rollers and tools for seven section stations, making nearly $50,000 for the equipment of the plants, not including ground and buildings. The annual fixed charges including interest, superintendent and assistant and eight foremen are estimated at $16,900. The cost of laying the repairs is estimated at 80 cents a square yard, 30 cents being for the asphalt, 15 cents for the other materials and 35 cents for mixing, carting and laying. He thinks the utilization of old material might reduce the cost at times to 50 cents a square yard.

Annual Report of the Board of Public Works of the City of Milwaukee, Wis., for 1902. Charles J. Foetsch, City Engineer.

The main items in the report are the following:

In the Water Department the total receipts were $579,032.48, an increase over the previous year of about 8 per cent. The disbursements were $168,238.17 for operating expenses, of which $21,000 was returned for taps, etc., made; $165,060.35 for extensions of water mains, of which about one-third was assessed as benefits on abutting property; interest and sinking fund, $214,407.50, and $100,000 to the general city fund. It is seen that, not-

withstanding the much-discussed reductions in water rates, there is a considerable profit from the works above all charges except depreciation. Nearly 11 miles of new mains were laid.

The sewerage department laid 16,000 feet of brick sewer and 23,000 feet of pipe at a total cost of $202,776, of which sum less than one-fifth was paid by special assessment. About $41,000 of this amount was for cleaning and repairing sewers and catch basins. The Jones Island sewage pumping plant lifted nineteen billion gallons of sewage and river water at a cost of $17,832. The plant also furnishes light and power to operate the garbage plant. The Milwaukee river flushing works forced over seventeen billion gallons from the lake into the river to flush it, at a cost of $18,887. A flushing tunnel of the same sort for the Kinnickinnic river is under construction.

The mileage of streets and alleys improved is 19½ at a cost of $455,230, a trifle less than half of which is assessed on the abutting property. New sidewalks were 8½ miles long, of which nearly 4 miles were cement.

Street sprinkling cost $64,569. Street cleaning cost $98,000, alley cleaning $21,000, and removal of ashes and rubbish $125,000.

The board also constructed several school houses, five engine houses, a natatorium and public library station and a garbage plant.

The garbage plant cost $80,630, of which $12,500 was for the right to use the processes.

Three natatoriums were maintained at a total cost of about $14,000 and were used by about 650,000 persons. Two of them were run all the year round and one for three summer months.

The new Grand-ave. draw bridge was constructed at a total cost of $87,522.

An ordinance has been passed and accepted providing for the depression of the Chicago & Northwestern Railroad in the Eighteenth ward, and bridges over the tracks at the street crossings.

ORGANIZATIONS AND INDIVIDUALS

Portland Cement Manufacturers—Fargo City Engineer—Professors for Engineering Schools—Indiana Engineering Society—Scranton Engineers' Club—Technical Meetings—Personal Notes.

The Association of Portland Cement Manufacturers.

Questions of importance to the cement trade were settled at the second annual meeting of the Association of Portland Cement Manufacturers, held Dec. 8 in New York. Forty-two companies were represented, being a large percentage of the $350,000,000 capital invested in the business. The meeting was held to enable the members to exchange views as to the best methods of manufacturing cement and of extending and developing the business; to consider the reports of committees, and to elect officers for the ensuing year.

A number of the members represented to the association that because of the enormous demand for cement during the last two years they have been compelled to keep their mills in continuous operation day and night, and it had been impossible to make repairs. In view of this fact a resolution was adopted that the members of the association should close their mills for six weeks or more between Dec. 1 and April 1, to enable the necessary repairs to be made.

It was the consensus of opinion that, with prices as they are at present, the imports of foreign cement, amounting to about $2,000,000 in 1903, would be decreased considerably during the coming year. The amount of cement on hand at the various mills on Dec. 1 was found to be light, and much lower than had been anticipated. The association will erect a building at the St. Louis Exposition at a cost of between $35,000 and $50,000.

Robert W. Lesley of the American Cement Company retired from the office of president and was succeeded by J. B. Lober of the Vulcanite Portland Cement Company; A. F. Gerstell of the Alpha Portland Cement Company, formerly secretary, was elected vice-president; E. M. Young of the Lehigh Portland Cement Company, formerly treasurer, was elected secretary, and E. R. Ackerman of the Lawrence Cement Company becomes treasurer. The new executive committee consists of H. W. Maxwell, W. H. Harding, R. W. Lesley, W. R. Warren, George E. Bartol, E. M. Hager and S. B. Newberry.

A banquet was given by the association at Sherry's at night, at which a silver loving cup was presented to R. W. Lesley, the retiring president.

The companies represented at the meeting were as follows:

Alpena, John Monaghan; Alpha, A. F. Gerstell; Alsens, W. S. Sinclair, Mr. Babson; American, R. W. Lesley, J. W. Eckert, Wallace King, George Norris, C. M. Camm, H. B. Warner; Atlas, Howard W. Maxwell; Bonneville, W. H. Harding; Castalia, W. J. Prentiss; Catskill, J. W. Kittrell; Cayuga Lake, M. E. Calkins; Central, R. E. Griffith; Chicago, Norman D. Fraser; Coplay, J. T. Brady, Gabriel Blum, J. L. Berg, R. L. Morrell, James Butler; Dexter, G. E. Bartol, J. Brobston, G. A. Schneebele; Edison, W. S. Mallory, Lovell H. Carr, W. S. Pilling; Elk Rapids, Mr. Sly; Empire, C. A. Lockard, Mr. Kingsbury; German-American, G. C. Prussing; Glens Falls, W. W. Maclay, Byron Lapham; Helderberg, T. H. Dumary, Mr. Farrell; Hudson, L. C. Smith, E. Bravender, Mr. Bernard; Illinois, E. M. Hager, Morris Metcalf; Lawrence, E. R. Ackerman, M. S. Ackerman, L. V. Clark; Lehigh, E. M. Young; Martins Creek, J. B. Wight; Thomas Millen Company, . Millen; Nazareth, P. H. Hampson, M. J. Warner; Newaygo, B. T. Brecker; Northampton, Mr. Dunn; Peerless, J. R. Patterson; Peninsular, J. W. Shooe; Phoenix, J. Turner, Mr. Zipperlein; St. Louis, J. C. Robinson, E. E. Paramore, A. J. Craney, jr.; Sandusky, S. B. Newberry, P. B. Beery; Virginia, W. R. Warren, F. H. Lewis, F. W. White, D. E. Rianhard; Vulcanite, J. B. Lober, B. F. Stradley, W. D. Lober, W. R. Dunn, H. A. Shaffer, Albert Meyer; Wayland, V. T. Whitmore; Whitehall, W. B. Whitney, Thomas M. Righter, W. E. Erdell; Wolverine, L. M. Wing; C. H. Wood; Standard, W. G. Henshaw of California.

The extracts given herewith from the report of the executive committee will show the progress which has been made by this committee and sub-committees toward the settlement of many questions of great interest to both makers and users of cement. In this connection it may be suggested that the third edition of the Directory of American Cement Industries will be issued in 1904 and will contain the latest and fullest information about the cement factories of this country and the latest and fullest information available upon the production of and the demand for cement for domestic consumption and exportation.

The report of the executive committee, of which R. W. Lesley of the American Cement Company, was chairman, reads in part as follows:

The executive committee beg to report as follows:

Your association grew out of a call, signed by twenty-three companies, for a meeting at Sherry's, Forty-fourth-st. and Fifth-ave., New York, on Sept. 11, 1902.

The subject of the call was stated to be as follows:

"The undersigned, manufacturers of Portland cement, recognizing the fact that the present methods of handling of 'sacks' are almost universally unsatisfactory, and believing that the question can be profitably be discussed and a satisfactory plan evolved at a meeting of the eastern mills, hereby pledge themselves to attend such meeting."

Prior to the meeting, the gentlemen in attendance enjoyed a very charming lunch and during the course of the informal speeches, the thought of such an association as we now have, was brought forward. The thought was father to the deed, and our association was formed with twenty members signing the constitution.

At the first annual meeting of the association there was submitted to the association, which was composed of representatives of eastern mills only, a suggestion on behalf of the Central Association of Cement Manufacturers, composed of western mills exclusively, that the two associations should co-operate. This important suggestion met with the full approval of your association, and at the quarterly meeting on March 10, 1903, ten companies, members of the Central Cement Association, were present, and all became members of our association, thus making the Association of Portland Cement Manufacturers no longer local, but a National Association. The membership has now grown from twenty to forty-six, representing manufacturers from the Atlantic to the Pacific Coast. The estimated output of Portland cement which is now represented in our body being from 90 per cent. to 95 per cent. of the total product of the United States.

During the year there were brought forward many questions involving freight rates and also other transportation questions. The most important of these and the settlement of which was brought about by co-operation between our asso-

ciation and the railroads, was a uniform method regarding the return of empty bags. This action resulted in the issuance of uniform circulars by all the the member of our association to their respective customers, and, similar notices by all the railroads to their freight agents, resulting in a uniform method for the return of bags and the payment of freight thereon.

In the fall there was also a reduction of freight to Chicago and western points not taking the 60 per cent. rates; another result of the work of our transportation committee.

Under similar lines of co-operation, a committee was appointed by your association to confer with representative manufacturers, members of the Iron and Steel Association, in the matter of testing and standards for concrete steel construction. This suggestion, which had root in our association, has extended from the two associations originally contemplated to the American Society of Civil Engineers, which will bring up the matter at its next annual meeting in January, 1904, and to the American Society for Testing Materials, which has appointed a committee to act in unison with those already referred to. The effect of this will be that by standard methods in this important form of construction the possible danger to the cement industry by improper and careless construction of concrete steel bridges, buildings, etc., will be entirely obviated.

The importance of a standard specification for cement has certainly been recognized by all of those connected with cement, either as engineers, consumers or manufacturers. Certainly, no class recognizes it more fully than the members of our association. To do away with the many hundreds of varying specifications which come to the mills during the course of the year, and to substitute for them a single specification, well thought out, well considered and well adjusted, would be of great value.

Following the line of co-operation already referred to as part of the business of this association, your cement committee has been represented upon a joint committee of the American Society for Testing Materials. This society is seeking to find a field as a general clearing house for the making of specifications in the interest of consumers, engineers and producers. The committee to which this matter of uniform cement specifications has been referred is composed of engineers connected with the drafting of the United States army specifications, of the entire committee of the American Society of Civil Engineers on the manipulation and testing of cements, of representatives of the engineering departments of the New York Central, Baltimore & Ohio, Illinois Central and Pennsylvania railroads, of representatives of the Cement Committee of the American Railway Engineering and Maintenance of Way Association. The Institute of Architects has been invited also to be represented on the cement committee of your association.

The methods of manipulation adopted in the progress report of the American Society of Civil Engineers, were made the standard for the purposes referred to, and samples of some eight different cements were sent to some thirty-odd laboratories to be tested in accordance with the methods described. These tests have been completed and a summary has been made of them, and from this summary a suggested specification has been laid before the committee of the American Society for Testing Materials, and has now been sent for final examination and approval to all its members, with the object of having replies by February 1, 1904, at which time a meeting will be held for the final adoption of the specification.

It is needless to say that a standard specification, which has grown from the intelligent work of the American Society of Civil Engineers' committee, coupled with the thought of the United States army engineers, the American Railway Engineers and Maintenance of Way Association, the American Society for Testing Materials and your own association, and practically determined in the laboratories to which the samples were sent, will, when adopted, command the regard and respect of all engineers, consumers and producers of cement.

Further in the line of co-operation with sister societies may also be mentioned the meeting held in New York on Dec. 1, 1903, between your committee on uniform contracts and a committee appointed by the National Builders' Supply Association to confer with us on the subject named. This was the first meeting between the manufacturers of, and the dealers in, cement, and it may be stated that the best of feeling and co-operation marked the meeting, and that it was thought highly advisable by both parties that many similar meetings should be held during the course of every business year, and the National Builders' Supply Association havea emphasized their views on the subject by extending to our association an invitation to join the annual meeting of the National Builders' Supply Association, to be held at Buffalo, N. Y., on Feb. 3, 1904.

The manufacture of Portland cement by the United States government, on the site of the Tonto Dam, in Arizona, was brought before your executive committee by representatives of mills on the Pacific coast, and in connection with these gentlemen who have now become members of our association, an effective argument was addressed to the Secretary of the Interior. After a hearing of several hours in which the matter was fully gone over, a decision was rendered giving the victory to the cement men, the government deciding not to make cement on the site of the dam, but to advertise for bids for cement under either of the two following methods, viz.:

First—Cement manufactured elsewhere and shipped to Phoenix or Globe by rail, and then hauled to the dam site.

Second—The government to furnish a

250-barrel-per-day mill at the site with power to operate it, and the contractor to manufacture it there.

Fargo's City Engineer Earns His Salary.

Mr. Sam F. Crabbe, city engineer at Fargo, N. D., recently asked the City Council to reduce his salary 50 per cent. during the winter months, as his time is only about half employed during that season. After recovering from their surprise the Aldermen decided to allow Mr. Crabbe to earn all this salary during the busy months, but to continue paying his salary as heretofore.

Professors for Engineering Schools.

One of the problems to which engineering schools ought to give immediate and serious consideration has grown out of the practice of obtaining professors by "in-breeding," as it has been characterized, meaning by this the recruiting of the young teachers, soon to be developed into full-fledged professors, from among recent graduates, with little more than their school experience to their credit. This species of selection has become an increasing fashion within the past ten years, or perhaps better put, an increasing necessity, due to the cramped financial conditions ruling with most of the schools, and the result has undoubtedly been a narrowed degree of usefulness of instructors and professors, and a more closely circumscribed value in the engineering market of the young graduates forced into it. In a few instances, it is true, prominent engineers, actively engaged in professional work, have been induced to lecture occasionally at such schools, thus vitalizing the college atmosphere with the spirit of actual engineering and through such lectures some good has been accomplished. In several recent instances, also, men fresh from engineering fields have been secured as the heads of engineering school departments, and as such afford admirable illustrations of a policy which is to be much commended. But these are only isolated examples of what should be general practice. — Cassier's Magazine for January.

The Scranton Engineers' Club.

Each year the Scranton Engineers' Club publishes a directory giving full information about its members and about the society itself. The society is in a flourishing condition, having about 175 members and showing a healthy growth.

Indiana Engineering Society.

The Indiana Engineering Society presents a program for its convention at Indianapolis Jan. 14, 15 and 16, 1904, which promises to be more than usually interesting and valuable. It indicates that the society is endeavoring to include all branches of engineering in its interests. The program includes among others the following:

"The Indiana Assessment Law," by C. A. Kenyon, Indianapolis.

"The Indianapolis Municipal Testing Laboratory," by Walter Buehler, Assistant City Engineer.

"Computing Machines," by Prof. C. B. Veal, Purdue University.

"Structural Timber," by Prof. W. K. Hatt, Purdue University.

"Bridge Abutments and Piers," by Prof. W. D. Pence, Purdue University.

"More Light on the Theory of Concrete," by S. B. Newberry, Sandusky Portland Cement Company.

"Stream Pollution in Indiana, with Special Reference to the Purification of Strawboard Refuse," by M. O. Leighton, United States Geological Survey.

"The Sewer System of Connersville," by Karl L. Hanson, City Engineer.

"Sewerage and Sewage Disposal at Bedford," by G. C. Houston, City Engineer.

"The Septic Tank and Filter Bed of the Eastern Hospital for the Insane," by Prof. R. L. Sackett, Earlham College.

"Filters vs. Contact Beds in Sewage Purification," by W. S. Shields, City Engineer, Chicago, Ill.

"The New Centralized Power and Heating Plant of Purdue University," by Prof. J. D. Hoffman.

"Steam Heating from Central Station," by Fred B. Hofft, Indianapolis.

"A New Automatic Stationary Engine," by F. F. Shandler, Indianapolis.

"Power Chains and Their Use," by Charles H. Hills, Indianapolis.

"Smoke Prevention," by R. P. King, Indianapolis.

"Cost Keeping," by Harry B. Marsh, Indianapolis.

"Locomotive Testing at St. Louis Exposition," by Prof. W. F. M. Goss, Purdue University.

"Surveys for Electric Railway Construction," by Charles L. Sellers, Peru.

"Interurban Railways in Small Cities," by John W. Fulwider, Lebanon.

"Some Special Street Railway Work," by Thomas B. McMath, Indianapolis.

"Statistics of Indiana Interurban Railways," by R. P. Woods, Indianapolis.

"Railroads," by A. Shane, Frankfort.

With reports of standing committees this makes a full program for a convention of six sessions.

Technical Meetings.

The fifth annual convention of the highway supervisors will be held at Albany, N. Y., Jan. 26 and 27.

At the regular meeting of the Engi-

neer's Club, held at Philadelphia Nov. 21, "Cement and its Uses" was the topic of discussion.

The annual meeting of the Iowa Brick and Tile Association will be held in Mason City, Ia., Jan. 20 and 21.

The annual convention of the Illinois Clayworkers' Association will be held at Danville, Ill., Jan. 5 and 6.

The Wisconsin Clayworkers' Association will hold its fourth annual meeting at Portage, Wis., and the dates as now proposed are March 1, 2 and 3.

The midwinter good roads meeting of the National Good Roads Association will be held at Ormond Beach, Fla., Jan. 28 and 29.

At the annual convention of the League of California Municipalities at Stockton, Cal., Dec. 9, the subject of oil for good roads was discussed. A. T. Lightner, trustee at Bakersfield, stated that his city has thirty miles of oiled streets; that last year 11,000 barrels were applied at a cost of 60 cents per barrel, ninety barrels being used in the first application on each 350-foot block, the width of all streets being fifty-one feet. C. B. Seeley of Napa said that oil had been tried on twenty-five miles of macadam with satisfactory results. Considerable attention was also given to the litigation whereby the inventors of machines for applying oil are attempting to recover damages. The use of salt water for street sprinkling was thoroughly discussed.

The December meeting of the New England Waterworks Association was held in Boston Dec. 9. A paper on "Notes on the Building of a Storage Reservoir" by Walter H. Richards and one "Rainfall and Runoff from Catchment Areas" by Lewis M. Hastings, C. E. of Cambridge, Mass., were read. W. R. Grace, superintendent of waterworks at Rockland, Mass., urged the desirability of making water rates a lien on the property occupied by the consumer and moved the appointment of a committee of three to look into the matter and report at the January meeting. The matter carried and the president stated that he would appoint the committee later.

Personal Notes.

W. J. Harsett has been elected mayor at Sacramento, Cal.

Hon. E. E. Schmitz has been re-elected mayor at San Francisco, Cal.

Arthur W. Dean of Nashua, N. H., has been appointed state highway engineer of New Hampshire.

G. H. Kimball has been appointed acting superintendent of public works at Little Rock, Ark.

Charles E. Phelps, jr., has been reappointed chief engineer of the municipal subways of Baltimore, Md.

Peter J. Ford has been elected president of the drainage board and William G. Legner vice-president, at Chicago.

John R. Hardin has been appointed park commissioner at Newark, N. J., to succeed Howard W. Hayes, who died Nov. 26.

John C. Brackenridge, M. Am. Soc. C. E., has been appointed commissioner of public works of the borough of Brooklyn.

N. L. Taylor, who gave up the office of city engineer at Tacoma, Wash., Dec. 31, 1903, has established an office at 801 N. I-st., Tacoma.

W. A. Cattell, M. Am. Soc. C. E., consulting engineer, has removed his offices in New York City from 42 Broadway to the Park Row Bldg.

Hon. C. C. Digby, mayor of Charleston, Ill., visited Indianapolis, Ind., Dec. 12 to obtain some information regarding street cars and interurban roads.

C. H. Danenhower, conduit engineer of the Cincinnati Gas and Electric Company, Cincinnati, O., was appointed general engineer of that company Dec. 1.

Mr. Thomas Cyprian Frenyear, sales manager of the new Canadian Westinghouse Company, died of typhoid fever at Ft. William, Canada, on Dec. 10.

Henry Burton has been elected superintendent and consulting engineer, and Thomas Riddle, jr., chief engineer to the Water Board at Port Huron, Mich.

Williams & Whitman, civil and sanitary engineers, have removed from 702 Fuller Bldg., New York City, to 902 Whitehall Bldg., Battery Park Place.

O. Perry Saile, C. E., 146 Westminster-st., Providence, R. I., has been appointed engineers of waterworks and sewers at Hickory, N. C. Edward W. Shedd will be associated with him.

Messrs. Fred J. Potters, Samuel E. Bower, William A. Shreve, Joseph L. Caughlin and David R. Brown have been appointed members of the water commission at Bordentown, N. J.

Oliver N. Eiler has resigned as superintendent of the municipal electric light and waterworks plants at Portland, Ind., to accept a position with the S. M. Smith Company at Noblesville, Ind.

W. H. Hall of Birmingham, Ala., has been appointed superintendent of public works at Columbus, Ga., to succeed Robert L. Johnson, who was killed by the caving in of a trench Sept. 30.

John D. Allen has been appointed vice-president and general manager of the Allis-Chalmers Company. Mr. Allen has been associated with the company for more than twenty-five years.

Gen. Francis V. Greene, commissioner of police, New York City, has tendered his resignation to take effect on Dec. 31, to become general manager of the Niagara and Ontario Power Company.

John C. Eversull, retired civil engineer, died at his home in Mt. Airy, O., Dec. 12, aged ninety-one years. Mr. Eversull constructed a number of turnpikes in Hamilton County leading to Cincinnati.

Henry Merdian died at his home in De-

troit, Mich., Nov. 29, aged sixty-three years. Mr. Merdian was a paving contractor, his business being conducted under the name of the Henry Merdian Company.

Charles Baillarge has resigned the duties of city engineer at Quebec and has been succeeded by his son, W. D. Baillarge, who has the title of acting city engineer. Mr. Baillarge has filled the position of city engineer for a number of years.

Hon. Alen C. Fobes, newly-elected Mayor at Syracuse, N. Y., has appointed heads of departments under his administration as follows: Ralph S. Bowen, commissioner of public safety; Aaron R. Thompson, commissioner of public works; corporation counsel, Walter W. Magel; city engineer, Frank J. Schnauber, reappointed.

Frederick W. Cappelen, former city engineer of Minneapolis, Minn., has been engaged by the special council committee of that city to assist in determining the cost of producing electric power in that city and to secure comparative figures of the cost of electric lighting and power in the various cities of the United States under similar conditions.

Robert Grimes, prominent in bridge building, died at Elmira, N. Y., Dec. 8. He was for years connected with the Union Bridge Company. Among the bridges he built are the first iron pier at Coney Island, the cantilever bridge at Louisville, the viaduct from the Harlem river to the Grand Central Station in New York City.

MACHINERY AND TRADE

The American Road Roller Company.

The American Road Roller Company is a new corporation, of which William Churchill Oastler, Asso. Am. Soc. C. E., is president and Jay Conger is treasurer. It is the successor to the business of Wm. Churchill Oastler and also to that of the Conger Manufacturing Company. The principal offices of the company are at 156 Fifth-ave., New York, and the works are at Groton, New York. Mr. Oastler has carried on a business in steam and road rollers and street and street cleaning and construction machinery for over twenty-five years and his machines are widely and favorably known. The Conger works at Groton were completed just before the combination was made and the new company starts out with better facilities than the old and with the prestige of the reputation of both of them.

Allis-Chalmers Company's New Standard Reynolds Corliss Engine.

We illustrate herewith a new Corliss engine which is being brought out by the Allis-Chalmers Company from the designs of Irving H. Reynolds. The field of Corliss engine designs has been so fully worked over in the past, and the accepted designs have become so simple, that no strikingly novel designs are to be expected. The present machine, however, represents the experience of twenty-six years in building of Corliss engines and combines all of the desirable elements of the best designs.

Engines of the type illustrated are being built in seven sizes, ranging from 50 to 500 horse-power, and are designed for steam pressures up to 150 lbs. They are built of somewhat shorter strokes than have heretofore been customary in Corliss engines, with the idea of economizing in space and making the construction more rigid. The speeds are also somewhat higher than usual, ranging from 110 to 150 revolutions per minute, although these speeds are not higher than those at which the Reynolds-Corliss engines of older design are frequently operated.

The frame is cast in one piece with the slide, the construction being of the box type, resting on the foundation for its entire length. The main bearing shells are bored into the frame, thus insuring a solid bearing and also permitting the easy removal of the shells by rolling them out around the shaft.

The slide is of the barrel type with bored guides. The crosshead is fitted with babbitt-faced shoes with wedge adjustment. The piston rod is screwed into the crosshead and held firmly with a steel lock nut. The cylinder is of the round cornered type, is fitted with double ported steam and exhaust valves, lagged with planished steel. The cylinder is set on a

cast-iron base plate, which extends under the valve gear, serving as a drip pan.

The valve gear is of the usual Reynolds Corliss type, the wrist plate being of skeleton pattern and fitted with a new type of disconnecting device which, while clamping the hook rod firmly, is very easily detached by hand.

The dash pots are of differential plunger type without leathers or packing of any kind.

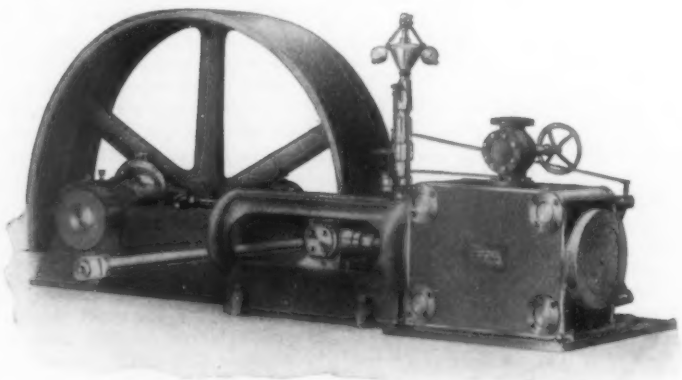
The regulator is of the high-speed weighted type, designed to control the engine within narrow limits of speed variation.

The connecting rod is of steel with solid forged ends, fitted with bronze boxes, babbitt-lined on the crank pin ends, the boxes being adjustable by means of screw actuated wedges.

The crank pin is of plain type, polished on the face, and is protected by a planished steel oil guard (not shown in cut).

The engines are fitted either with belt flywheels, as shown, or with square rim wheels where used with direct connected electric generators. The crank and crosshead pins and main journals are of a size ordinarily used with heavy duty engines.

In brief, the engine is strong, simple and compact, and while nothing has been added for ornamentation, nothing contributing to economy or durability has been omitted, and the machine should find a large sale among power users who appreciate quality.



NEW CORLISS ENGINE OF ALLIS-CHALMERS CO.

Kentucky Rock Asphalt for Floors and Pavements.

The Wadsworth Stone and Paving Company of Pittsburg, owners of rock asphalt mines on Green river, Kentucky, who for the past two years have been using American rock asphalt which they had formerly laid, have opened a New York office at 32 Broadway, under the management of Mr. T. Hugh Boorman.

They are now selling quantities of their mastic to contractors throughout the country and there is a special call for it for brewery floors.

This mastic contains nothing but pure material, viz.: Silica, carbonate of lime and bitumen, free from residuum oils or earthen or vegetable matter, which no imported mastic can claim.

The company is also preparing to deliver rock asphalt powder ready for use by municipalities for repairs and are perfecting plans for moderate cost machinery of improved construction, which will be much appreciated by city engineers and commissioners of public works.

A Press for Making Cement Pipes.

The Kielberg molding press has been used for some years in Europe for making cement pipes and is now being introduced in this country by H. Schebye, C. E.

The machine uses a cylindrical mold, inside of which works a mandrel, which serves the double purpose of forming the inner surface of the pipe and of compacting the cement paste or mortar of which the pipe is made. The mold is made in two semi-cylindrical halves which are clamped together by a self-locking band. Flanges or sockets are made as desired.

To mold a length of pipe one of the cylindrical molds is set up concentric with the ring. The mandrel is then lowered into it until the helical thread is nearly in contact with the bottom ring. Enough cement to form the pipe socket

is then placed inside the mold and the mandrel is rotated by means of gearing. The effect of this rotation is to cause the helical thread to force the cement downward and fill the socket. The rotation is then continued, more cement being added at intervals and the mandrel being gradually moved upward, until the mold is filled to the top. The mandrel is then withdrawn from the mold and the latter with its contents and base plate is by means of an especial form of car removed to the store-room, where the iron foot of the mold is exchanged for a wooden one. This done, the pipe is placed upright and the mold taken away whilst the pipe is left to harden.

The capacity of one machine is stated to be as follows per hour:

6	9	12	15	18	20	24	Inches.
10	11	8	7	5	5	4	Pieces 3 ft. long

The pipes made by this machine are very smooth internally, and being molded under pressure, the concrete after hardening is very strong. The figures in the accompanying table below represent the breaking loads on pipes of different sizes, three months old. These tests were made by Dr. Toepffer, Finkenwalde, Germany. The pipes were laid flat and loaded on the upper surface.

Table showing results of tests of cement pipe, 3.28 feet long and of various diameters:

Composition of Mortar.			Diameter inside.	Thickness.	Breaking load.
Cement.	Sand.	Small stones.			
			Inch.	Inch.	Lbs.
1	3	.....	7.87	1.03	6,455
1	3	.....	9.84	1.10	6,305
1	2	1	9.84	1.10	7,059
1	1½	1½	9.84	1.10	5,855
1	1	2	9.84	1.10	5,324
1	3	1	9.84	1.10	5,789
1	3	.....	11.02	1.18	5,216
1	4	.....	11.02	1.18	5,027
1	3	.....	19.78	1.57	5,247

Other tests made by the Royal Technical Academy, Stockholm, Sweden, showed that the cement pipes were stronger than those of glazed earthenware, and that they were also less porous. This was proved by placing nine lengths of each type of pipe upright, closing them at the bottom and filling with water. At the end of fourteen days the water level had sunk 23mm. in the cement pipes and 150mm. in the earthenware pipes.

Art Stone.

The first book written on the artificial stone and hollow concrete building block subject makes its appearance Jan. 1. It was written by F. W. Hagloch, Rose Building, Cleveland O., and gives plain instructions in easily understood language for the making of artificial stone and hollow concrete blocks in all its uses. It also gives much information as to making colored artificial stone ornaments of all kinds. The author is a practical civil engineer who nas devoted many years to the subject of concrete and in recent years has devoted his entire time to the artificial stone industry. In this work he describes all hand and machine methods and has taken great care in describing every detail so that, he believes, any one of common school education and ordinary mechanical ability can by use of this book make all kinds of artificial stone successfully, special attention being given to the materials and devices most suitable for this line of work. A catechism of over 100 questions and answers gives a full review of the subject. The appendix consists of a glossary defining the unfamiliar terms used by the trade. It is an instructor for the beginner and a ready help for the most experienced. It is neatly bound in cloth and can be had by sending $1.50 to the author.

Trade Publicat ons.

Jeffrey coal washing machinery is shown in catalogue 52 of the Jeffrey Mfg. Co. of Columbus, O.

Jeffrey Screening Machinery is illustrated and described in catalogue 69 of the Jeffrey Manufacturing Company, of Columbus, O.

The Cement Machinery Company, Jackson, Mich., sends a large card illustrating and describing the new 32-inch Normandin concrete block machine.

Circular No. 73 of the Jeffrey Manufacturing Company, Columbus, O., gives a general illustrated list of the various manufactures of this company in pocket book form handy for consultation.

The Engineering Company of America, 74 Broadway, New York, sets forth its growth, efficiency, methods, problems and results in a convenient little folder which also contains a long list of engineers in charge of the company's work.

The Medina Quarry Company, 150 Nassau-st., New York, issue "to architects, contractors, owners, and other interested persons" a handsomely illustrated booklet describing the product of their quarries at Albion, New York, and its use in buildings and pavements.

Julian Scholl & Co., 126 Liberty-st., New York, issue a catalogue of their Reliance steel stone crushers and portable stone crushing plants, including folding elevator, revolving screens, portable bins and road-roller or other portable engine.

Trade Notes.

ASPHALT.

The Ada Asphalt Company, Ada, Ind. Ter., is developing asphalt fields at that place.

The asphalt plant of Brayer Bros. near the city limits of Auburn, N. Y., was destroyed by fire Dec. 18.

A fire in the plant of the Barber Asphalt Paving Company at Long Island City Nov. 26 caused a loss of about $500.

The purchase of an asphalt plant to repair the asphalt streets in Allegheny, Pa., is recommended by E. J. McIlvain, director of public works.

The Boston Oil and Asphalt Company, Washington, D. C., has been incorporated by R. S. Donaldson, E. W. McCormick and James F. Shepperson.

A two-foot vein of asphalt was found recently on U. G. Leevey's farm near Robinson, Kas., while digging a well. Samples have been submitted for analysis and if a favorable report is rendered the deposits will be developed.

Capitalists of Beaumont, Tex., will develop asphalt deposits in the Wolf Creek valley in Pike County, Arkansas. J. E. Blackburn, president of the Texas Crude Oil and Mining Company, Beaumont, has secured 1,500 acres in fee simple, a lease on 1,000 more acres and an option on 30,000 which are supposed to contain one of the finest beds of asphalt in the country.

An attachment was served on the Federal Asphalt Company at Black Rock, Grayson County, Ky., Dec. 3. The attachment was sworn out by the Central Coal and Iron Company at Central City for $1,053. The Federal Asphalt Company was incorporated in West Virginia. Its mines are located three miles from Big Clifty. Another attachment for $4,800 has been sued for at Ft. Wayne, Ind. President Coffeen has not yet made a statement of the affairs of the company, but promises to do so in a few days.

BRICK.

The clay at Oak Park, Minn., is adapted to the manufacture of paving brick, according to press reports, and a plant will be established.

The Clarinda Mining and Manufacturing Company, Clarinda, Ia., will erect a plant and engage in the manufacture of pressed and paving brick.

The erection of a large paving brick plant at New Albany, is contemplated by McCann, Fitch & Converse of Chicago, Ill.

The Staten Island Brick and Tile Manufacturing Company, Washington, D. C., has been incorporated by George Lodge, Walter Bevans and Charles M. MacGowan.

Ike A. Chase, Memphis, Tenn., desires to correspond with parties who would be interested in a site for the establishment of a fire brick and sewer pipe plant.

H. Huennekes & Company, 114 Liberty-st., New York, show many highly commendatory letters from those who have purchased plants of them and those who have investigated the qualities of their product, sand lime brick.

CEMENT.

The Consumers' Gypsum Company, Port Clinton, O., has been incorporated.

The plant of the Aetna Cement Company, Fenton, Mich., is being improved.

The Cumberland Cement and Paving Company, Cumberland City, Tenn., has been incorporated.

Plans are being discussed by the Directors at Detroit, Mich., for reorganizing the Hecla Portland Cement Company.

The construction of immense Cement works near Laverty, Indian Territory, 10 mis. west of Chickasha, is contemplated.

Balfour, Guthrie & Company, of London, will engage in the manufacture of cement near Whatcom, Wash., according to press reports.

The Galveston, Houston & Northern delivered to W. L. Macatee & Sons of Houston, Tex., Jan. 11, 8,000 sacks of cement of 95 pounds each.

The Carbutt Gypsum Company, Rochester, N. Y., has been incorporated to mine gypsum, by John D. Lynn, Smith O'Brien and Carroll A. Thompson.

The National Portland Cement Company, First National Bank building, Easton, Pa., will have a new 16-kiln plant in operation in the spring.

The Wyandotte Cement Company has been incorporated by George B. Morely, of Saginaw; Standford T. Crapo, John B. Ford, Harry J. Baxton and Benjamin F. Berry of Detroit.

The Redfield Cement, Brick & Tile Manufacturing Company, Redfield, S. D., has its new machinery in running order and will begin making cement bricks and building blocks in the spring.

A Boston company has purchased of Hon. J. F. Wilkhouse of Orvillo, Ala., cement rights on 1,000 acres of land at West Dallas, Ala. and will erect a large plant for manufacturing Portland cement.

The plant of the Ft. Scott Hydraulic Cement Company, Ft. Scott, Kas., was entirely destroyed by fire Dec. 11. The plant was principally owned by Walter Halliwell and D. P. Thomas of Kansas City.

The plants of the Glens Falls Portland Cement Company, with the exception of one have been closed for a short time on account of a fire.

The Bronson Portland Cement Company, Bronson, Mich., has been closed for the purpose of being put in good condition for an early renewal of business.

Valuable beds of cement extending over an area of several miles square and directly adjoining Anadarko, O. T., have been located, according to press reports from Andarko.

The Bronson Portland Cement Company has acquired some of the property of the Kalamazoo Cement Company, Kalamazoo, Mich. The company has also increased its capital stock from $500,000 to $1,000,000.

P. F. Haley and G. G. Hough, managers of the Bridger coal mine, Bridger, Mont., have found another deposit of gypsum one and one-fourth miles from the railroad. Where exposed the ledge is eight feet thick.

The Gypsum fields around Watonga, Ok., are pronounced by G. P. Grimsby, secretary of the Kansas Academy of Science, among the richest in the United States. Mr. Grimsby has been investigating the deposits for Oklahoma City and El Reno investors.

The repairs being made to the plant of the Alpena Portland Cement Company, Alpena, Mich., will be completed early in January. At a recent meeting of the directors they unanimously voted to change from the wet to the dry process, which will require about three and a half months and will cost between $50,000 and $60,000. Herman Besser, president.

The Standard Portland Cement Company, Detroit, Mich., filed amended articles of association Nov. 27, converting $300,000 of common stock into preferred stock. The company is building a railroad from its property in Benzie County to Lake Michigan, where it has a large pier. The construction of the plant will be commenced in the spring. Fred H. Aldrich, secretary.

The Consolidated Cement Company has made a proposition to the county board at Milwaukee, Wis., to sell its Whitefish Bay property for prison use. The Whitefish Bay property consists of 75½ acres and is fully equipped with all the improvements necessary for furnishing an output of 1,000 barrels a day. W. Bollow, agent.

The Kentucky Portland Cement Company, of Delaware, has been reorganized by Detroit capitalists who have taken over the holdings of the company and will begin at once the construction of a large cement plant at Marengo, Ind. Congressman F. L. Wheeler is president and John Lokie is secretary and treasurer of the new company. Both gentlemen are residents of Detroit. The Kentucky Portland Cement Company was organized in Louisville, Ky., in 1902 with C. J. Meddin as president and C. B. Nordeman as secretary and treasurer. Plans for a plant at Marengo will be made at once by C. H. Todge. The new company will be known as the Marengo Portland Cement Company.

The Wentz Engineering Company of Nazareth, Pa., will begin Jan. 2, the construction of a 1,000-barrel cement plant at Edgewater, Benzie County, Mich., for the Standard Portland Cement Company. The Standard Portland Cement Company is composed of F. H. Aldrich, 813 Hammond Building, Detroit; S. C. Symons, Saginaw; Wm. J. Cornwell, Cadillac; Edwin Fellows, Frankfort.

The Cement Tile Works, Sac City, Ia., is manufacturing drain tile out of cement concrete and will manufacture building blocks after molding dies invented by C. S. Larimer, manager of the company. The company will engage in sidewalk construction and will retail cement. A steam heat plant has been put in and operations will continue during winter and summer. The officers of the company are: President, George Glass; manager C. S. Larimer; secretary, Henry Barent.

U. R. Loranger, former secretary and manager of the Hecla Portland Cement & Coal Company, Bay City, Mich., filed in the United States Court Dec. 9, a sworn petition asking the court to permit him to intervene in the foreclosure suit brought against the Hecla Company by the Detroit Trust Company. The former secretary claims that the company's troubles are the result of a deliberate attempt to wreck the company in order that the properties might be secured at less than their actual value, he and others being principal creditors.

The Cement Workers and Helpers' Union at Springfield, Ill., has elected officers for the ensuing six months as follows: President, W. Fifield (re-elected); vice-president, Joe Bostick; recording secretary, Clifford Fifield (re-elected); financial secretary, Alfred Overton (re-elected); treasurer, George Sifkin; warden, Pete Duffy; guide, Noah Roe. Trustees—C. Fifield, R. Lovejoy, F. McInern. Delegates to S. F. of Labor—W. Fifield, R. Lovejoy, C. Fifield. This is the fourth consecutive term that Clifford Fifield, the present recording secretary, has been unanimously elected to office.

The Alma Cement Company, which purchased the property of the Alma Portland Cement Company at Wellston, O., is rebuilding the plant and will be ready for operation about Jan. 1, 1903. The company does not expect to place cement on the market before March 1, however, as it desires its product to be properly aged before it goes out. The company's offices are in the Betz Building, Philadelphia, and its officers are as follows: President, B. B. Lathbury; vice-president, Frederick Strauss; secretary and treasurer, Mark T. Cox. William J. Donaldson in charge of sales department.

LIGHTING AND POWER.

The McClure Lighting Company, Minneapolis, Minn., has been incorporated by F. D. Clark, Edward Stump and W. M. Bruger.

The General Lighting Supply Company, Philadelphia, Pa., has been incorporated to furnish light, heat and uower and manufacture and sell lighting supplies.

The American Gas Machine Company, Albert Lea, Minn., has been incorporated by Ferdinand Larson, N. P. Christenson, J. P. Jensen, C. A. Ranson, Edward Olson, Geo. Hurd, E. W. Knatvold and others, all of Albert Lea.

The Saginaw United Electric Company and Bay City United Electric Company have been capitalized by Philadelphia capitalists, who will engage in electric lighting.

The Allgemeine and Union Elektricitats companies, Berlin, Germany, decided Dec. 5, to consolidate. The Union Company's 24,000,000 shares will be transformed into 16,000,000 shares of the Allemeine, making the capital of the latter $19,000,000.

A merger of electric and power plants in the coke regions and the Pittsburg, McKeesport & Connellsville railway system has been effected and applications for a charter for the combined interests will be made at Harrisburg, Dec. 31. The new company will be known as the Western Pennsylvania Railroad Company and will be in control of the entire lighting, power and street railway systems of Westmoreland and Fayette Counties and part of the trolley system of Allegheny County.

MISCELLANEOUS.

The works of the American Bridge Company at Ambridge, Pa., will be started Jan. 4.

The Plymouth Paving Co., Minneapolis, Minn., will manufacture sidewalk blocks this winter at Aitken, Minn.

One of the largest stone crushing plants in southern Minnesota has recently been completed by Fowler & Pay of Mankato, Minn.

The Canton Concrete Company, Canton, O., has been incorporated by J. N. McQueen, Peter Schisler, P. H. Weber, John Floom and A. O. Stentz.

The Pleasant Hill Sewer Company, Tupper Lake, N. Y., has been incorporated by Louis De Laucett, W. J. Devendorf and Barney Seigel of Tupper Lake.

The Nashville Roofing & Paving Company of Nashville, Tenn., will build a plant at Birmingham, Ala., for the manufacture of bituminous macadam.

The Wagner Stone Company, Sandusky, O., has been incorporated by Michael Wagner, Leo E. Wagner, Albert E. Wagner, Emil W. Wagner and Joseph F. Wagner.

The Ohio Paving Company has been incorporated at Indianapolis, acknowledging to interests in Indiana worth $5,000. John Kerlin, Montpelier, Ind., state representative.

The Powers Manufacturing Company, Clarinda, Ia., has been incorporated to manufacture well-boring and rock-drilling machinery and general well and water supply tools.

The Building Block Manufacturing Company, Minneapolis, Minn., has erected a large plant near Lake Calhoun for the manufacture of hollow concrete blocks for structural purposes.

Lewinson & Just, 452 Fifth-ave., New York City, have dissolved partnership and George A. Just will conduct the business of consulting and contracting engineers under the firm name of George A. Just & Co.

C. M. and John J. Murphy, formerly of the Fuller Construction Company have organized and incorporated the Murphy Construction Company, with offices at 112 and 114 W. Forty-third-st., New York City.

The Howard Hydraulic Cement Company,, Cement, Ga., desires to correspond with tile companies or parties who make tile for sidewalks, etc. Also with parties making tools for this walk. J. H. Warner, prest. & treas.

Mayer Bros., Mankato, Minn. have been incorporated to manufacture trip hammers, boilers, gasoline and steam engines, structural steel and iron, etc., with officers as follows: President, Louis Mayer; vice-president, H. F. Mayer; secretary and treasurer, Lorenz L. Mayer.

Mr. W. N. Thornburg has been elected vice-president of the Ohio Quarries Company. His offices will be in the Marquette building, 204 Dearborn-st., Chicago. Mr. Thornburgh has been connected with the sandstone trade for many years.

The Altoona Concrete Construction & Supply Company of Butler, Pa., has been incorporated under Delaware laws to manufacture the H. S. Palmer hollow concrete building block and Cochrane cement sand brick. The incorporators are Chas. C. Reeder, But'er, Pa.; S. P. Zetui-

Mr. F. S. Dickinson has been appointed sales agent of the Bedford Quarries Company with offices in the Flatiron building, 949 Broadway, New York City. Mr. Dickinson will have charge of the eastern sales of this company, which is the largest producer of Oolitic limestone in the world.

J. W. Sanderson of the Normandin Cement Building Block Machinery Company, Burlington, Ia., has sold cement block machines as follows: A company at Cedar Rapids, Ia., composed of William King, T. C. Munger and J. W. Sanderson; to Roney & Sheehan of Independence, Ia.; to Webster Cement Products Company, Webster City, Ia.; Rockford Concrete Construction Company, Rockford, Ill.; company at Oskaloosa, Ia., composed of G. H. Carlon & Sons and G. H. Carlon; Chris Riemer & Co., Marshalltown, Ia. The Normandin Cement block machine is in operation in 22 plants in Iowa.

The Buffalo Litholite Company has been incorporated to manufacture an artificial stone invented by C. W. Stevens of Harvey, Ill. The officers of the company are: President, Uriah Cummings, Akron, N. Y.; vice-president, Chas. H. Lockard, Syracuse; secretary and treasurer, Chas. Barnum, Buffalo.

Lewinson & Co. was recently incorporated with offices at 128 W. Forty-second-st., New York City, to conduct business as consulting engineers and contractors. MacMillan Lewinson, who is president of the company, has been, for a number of years a member of the recently dissolved firm of Lewinson & Just. D. B. Richardson is secretary and treasurer of the company.

"We pull for Leschens" is what you read on the large leather collars of the horses attached to the wagons of A. Leschen & Sons Rope Company in St. Louis, New York, Chicago and Denver. These are the wagons in which they deliver their reels and coils of Hercules and patent flattened strand and all other kinds of wire rope. A. Leschen & Sons Rope Company also manufactures and erects aerial wire rope tramways of every description; likewise underground and surface wire rope haulage plants. Their engineers in charge of the different departments have had years of experience and are thoroughly competent. 920 to 932 N. First-st., St. Louis, Mo., is the home office of A. Leschen & Sons Rope Company.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Davenport, Ia.—The Allen Paving case will come up on appeal in the United States Circuit Court on Jan. 11.

St. Joseph, Mo.—A sample block of paving will be constructed on Eighth-st., between Felix and Francis-sts., by Rackliffe & Gibson, using Purington block, which is manufactured at Galesburg, Ill.

Akron, O.—The property owners on Rhodes-ave. have been granted an injunction restraining the County Treasurer from collecting the assessments for improving that street, or the sale of their property as delinquents on their refusal to pay. They claim that the resolution providing for the improvement was illegal.

CONTEMPLATED WORK.

Frankford, Pa.—Paving is contemplated for various streets.

Hazleton, Pa.—An ordinance has been passed to pave Wyoming-st.

Scranton, Pa.—Cedar-ave. will be paved. Aleck T. Connell, mayor.

Pasadena, Cal.—Marengo-ave. will be paved its entire length, 2¼ miles.

Boston, Mass.—The question of widening Avery-st. is again being agitated.

Lincoln, Neb.—Bids will be asked in January for paving. City Engr. Campen.

Chicago, Ill.—Asphalt paving is proposed for State-st. from Thirty-ninth to Sixty-third-sts.

Orange, Tex.—The citizens voted to issue $25,000 bonds for road improvements.

New York City—The property owners on lower Park-row have petitioned for asphalt paving.

Albany, N. Y.—An ordinance has been approved by Mayor Gaus for paving Sherman-st. with asphalt.

Dallas, Tex.—The Dallas county comrs. will engage a civil engineer to prepare plans for county roads.

Nashua, N. H.—The bd. of pub. wks. contemplates paving Main-st., from City Hall to the Worcester tracks.

Fairview, Mich.—This village voted Dec. 12 to issue $36,000 bonds for paving, sewers and water mains.

Houghton, Mich.—(Special.)—W. V. Sacicki, vil. engr., says this village contemplates paving Sheldon-st.

Newport News, Va.—A bill has passed the Senate approving the issue of $56,000 bonds for street pavements.

Cedar Rapids, Ia.—The city council is considering a petition for the improvement of the Welchheimer road.

Los Angeles, Cal.—Petitions have been submitted to the city council asking for about 4 mls. of asphalt paving.

Little Falls, N. Y.—The question of paving all the principal streets is being considered. Cy. Engr. Lansing.

Walla Walla, Wash.—The necessity of paving Main and Alder-sts. is being considered by the Commercial Club.

Elyria, O.—The B. P. S. has asked the council to enact legislation providing for the paving of various streets.

La Crosse, Wis.—The property-owners on Mill-st. have asked for brick paving for that street, an alley and Rose-st.

Hays, Kas.—An ordinance has been approved for constructing sidewalks on various streets. W. H. Cakrick, cy. clk.

Atlanta, Ga.—The question of paving Marietta-ave., from Peach Tree-st. to a point near the government building with asphalt is under discussion.

Paris, Ill—Ordinances will be passed in January for paving S. Central, N. Central and Prairie-sts. Cy. Engr. Sawyer.

Mobile, Ala.—The board of public works will present the plan for the third paving contract to the general Council during January.

Atchison, Kas.—A resolution has been passed to pave 7,800 square yards of Parallel-st. with brick. Fred Giddings, cy. engr.

Atlantic City, N. J.—The property-owners on Iowa-ave., from Pacific to Arctic-aves., have petitioned for asphalt or bitulithic pavement.

New York City—The board of estimates appropriated $1,750,000 for the completion of the Riverside Drive extension, One Hundred and Thirty-fifth to One Hundred and Fifty-fifth-sts.

Philadelphia, Pa.—A boulevard from City Hall to the Green-st. entrance to Park is proposed. Macadam or asphalt paving will be used.

Marshalltown, Ia.—A resolution will be considered by the City Council Jan. 4 providing for paving Second, Third, Fourth and Fifth-sts., six blocks.

Greece, N. Y.—The town board has decided to construct about 6 miles of roads. Bids will be asked as soon as plans and specifications can be prepared.

Rushville, Ind.—The county commissioners have approved the report of the viewers for constructing 12 mis. of the Gowdy, Moscow and St. Paul pike.

Akron, O.—Ordinances have been approved for paving Upson and Locust-sts. with brick, and macadamizing South and Bill-sts. Chas. W. Kempel, mayor.

Decatur, Ind.—A petition has been submitted to the county auditor asking for the construction of a macadam road in Monroe township. Abe Boch, co. audt.

Frankfort, Ind.—About 20 mis. of new gravel roads will be built, as a result of the recent decision of the Supreme Court holding the gravel law to be constitutional.

Norwood, O.—Resolutions have been passed by the city council providing for the construction of macadam paving on Lawrence and Walton-aves. John Meyer, prest. cy. coun.

Washington, Ia.—A resolution was approved Dec. 7 for paving Iowa, Marion, Main and Washington-sts. with brick blocks. Objections will be heard Jan. 6. A. N. Alberson, mayor.

Grand Rapids, Mich.—Estimates have been prepared for paving Carner-st. with gravel or brick; Howard, N. Ionia and Ford-st. with gravel; College-ave. with asphalt block; Canal-st. with macadam.

Hudson, N. Y.—A resolution has been adopted by the Columbia county bd. of supvrs. to construct a state road 2 mis. long from Stottsville to this place, and one 1-mi long from Chatham to Chatham Center.

Ashland, Wis.—The committee appointed by Mayor Williams to report upon street improvements for next year favor macadam paving for W. Second and Third-sts. and Prentice and Vaughn-aves. with asphalt for Seventh and Ellis-aves. and Second-st.

CONTRACTS TO BE LET.

Ottawa, O.—Bids are asked until Jan. 28 for 7½ miles of stone road work. O. C. Talbot, cc. surv.

Paoli, Ind.—Bids are asked until Jan. 5 for building 37 mis. and 1,548 ft. of road. Geo. W. Tegarden, co. audt.

Cleveland, O.—Bids are asked until Jan. 6 for paving a number of streets with asphalt. A. R. Callow, sec'y B. P. S.

Lafayette, Ind.—Bids are asked until 10 a. m. Jan. 11 for constructing the E. B. Steeley et al. gravel road. Bd. comrs.

Le Mars, Ia.—Bids are asked until Jan. 16 for paving Sixth, Seventh and Main-sts. with vitrified brick. O. L. Loudenslager, clk.

Houston, Tex.—Sealed bids are asked until 12 m. Jan. 4 for constructing 32 mis. of gravel pavements. O. T. Holt, mayor; D. D. Bryan, secy.

Omaha, Neb.—Bids are asked until Jan. 22, according to local press reports, for building permanent sidewalks and for grading Fifteenth-st. and an alley.

Cincinnati, O.—Sealed bids are asked until Jan. 14 for paving McMillan-st. from May-st. to Auburn-ave. with asphalt. Geo. F. Holmes, clk. B. P. S.

Toms River, N. J.—Sealed bids are asked until Feb. 9 for building a gravel road in Union twp. 3.25 miles in length. Jas. E. Otis, dir. bd. freeholders.

New London, Conn.—Bids are asked until Jan. 14 for constructing a macadamized road between Ft. Mansfield and Watch Hill, R. I. Address Q. M., 27 Granite-st.

Bloomfield, Ind.—Bids are asked until 1 p. m., Jan. 5, for building 2 mis. of gravel roads in Smith twp. and ½ mi. of gravel road in Center twp. Bd. comrs.

Sullivan, Ind.—Sealed bids are asked until 11 a. m., Jan. 4, for building 4 mis. of stone roads in Haddon twp. Joseph Asbury, chmn. bd. comrs.; J. M. Lang, co. audt.

Port Townsend, Wash.—Bids are asked until Jan. 13, for building granolithic walks as approaches to buildings at Forts Worden and Casey. Geo. H. Penrose, Q. M., U. S. A.

Columbus, Ind.—Sealed bids are asked until Jan. 7 for 9,325 sq. yds. of brick paving on Washington-st., and 7,000 sq. yds. on Fifth-st. W. H. Rights, cy. engr.; Karl H. Vollond, cy. clk.

Upper Sandusky, O.—Bids are asked until Jan. 21 for paving Sandusky and Wyandot-aves. with vitrified brick or blocks, asphalt blocks, bituminous macadam or bitulithic pavement. Wm. C. Ruopp.

Crookston, Minn.—Sealed bids are asked until 8 p. m., Jan. 12, for granite macadam paving, granite or sandstone curbing and granolithic gutter on Broadway, Main, Fletcher and Third-sts. W. H. Graver, cy. clk.

Belleville, Ill.—Sealed bids are asked until Jan. 20, 1904, for paving W. Main and S. Illinois-sts. with brick, with stone curbing; paving Race, Second and Third-sts. with asphalt, with combined granitoid curb and gutter. Fred J. Kern, prest. B. L. I.

Toledo, O.—Bids are asked until Jan. 4, for brick paving as follows: John-st., 547 sq. yds.; Ostrich Lane, 1,005 sq. yds.; Prouty-ave., 1,650 sq. yds. Bids are asked until Jan. 18 for 1,620 sq. yds. of brick paving on Elm-st., and 5,930 sq. yds. on Auburn-ave. Harry S. Jones, secy. B. P. S.

CONTRACTS AWARDED.

Ardmore, I. T.—The contract for paving Main-st. with asphalt was awarded to J. S. Downard.

Cincinnati, O.—The contract for paving Fourth-st. with asphalt was awarded to the Kirchner Construction Company.

Atlanta, Ga.—The contract for paving N. Pryor-st., from Peachtree to Alabama, with asphalt, was awarded to Venable Bros.

Springfield, Mass.—The contract for constructing the Depot road was awarded to John Polcaro of Pittsfield for $22,658.

Chester, Pa.—W. E. Reilly was awarded the contract for relaying the sidewalks on Fifth and Lloyd-sts. at 55 cents a sq. yd.

Far Hills, N. Y.—The contract for macadam paving to the Morris county line was awarded to Augustus Munson & Company for $22,803.

Lexington, Mo.—The contract for paving Main-st., from Eighth to Thirteenth, was awarded, Dec. 15, to the Ft. Scott Stone & Const. Company for $1.74 a sq. yd.

St. Paul, Minn.—The contract for macadam paving on W. Seventh-st., from Tuscarora to Fort Snelling was awarded to Fielding & Shepley for $69,872.

Benton Harbor, Mich.—The Cleveland Asphalt and Paving Company, Cleveland, O., was awarded the contract for paving three streets at $1.87 a sq. yd.

Salt Lake City, Utah.—Paving contracts were awarded Dec. 13 as follows: E. First South-st., J. P. Moran, $21,711.25; cement sidewalks, R. S. Blome Company of Chicago, $29,596.

Bound Brook, N. J.—Bids have been received for macadam paving on Mountain-ave. to Warren twp. line, as follows: Frank Pidgeon, $10,828; William Rehill, $10,039; John McNabb, $7,832.

St. Augustine, Fla.—The contract for paving N. Charlotte and Washington-sts. with vitrified brick was awarded to Geisman & Leonard at $1.67 a sq. yd., and granite curbing at 48 cts. a lin. ft.

Pasadena, Cal.—Contracts were awarded Dec. 15 as follows: Building cement sidewalks in Bellefontaine-st., Andrew Holloway, 8.3 cts. a sq. ft.; Grading, curb and gutter in Carlton-ave., Charles Mushrush, 65 cts. a cu. yd. for grading, 20 cts. a lin. ft. for curb and 13 cts. for gutter. Pleasant-st., E. J. Hart, sidewalks, 5.25 cts.; grading, 29 cts.; curb, 20 cts. and gutter, 13 cts.

Kansas City, Mo.—The contract for resurfacing Westport-ave. from Main-st. to Shawnee-ave., was awarded to the Barber Asphalt Paving Company at $1.85 a sq. yd. Other contracts for asphalt paving were awarded as follows: 40th-st., from Main to Oak, Parker-Washington Company, $7,242.35; 23d st., from Indiana to Cleveland, Gilsonite Company, $10,225.40; brick sidewalk, 25th-st., from Michigan to Cleveland, Missouri Sidewalk Company, $284.70; curbing Locust-st., from 20th-st. to Belt line tracks, Kansas City Sidewalk Company, $185.25.

Buffalo, N. Y.—Bids have been received for paving as follows: Repaving Walden-ave., German Rock Asphalt Company, asphalt, $12,065; paving Hartman-place, Eastern Construction Company, asphalt, 86,300. F. V. E. Bardol bid the same sum for brick; repaving Tonawanda-st., German Rock Asphalt Company, asphalt, $36,042; L. H. Gipp, brick, $30,500.

Cadillac, Mich.—Bids were submitted Dec. 8 for paving the principal streets as follows: Cleveland Trinidad Asphalt Company of Ohio, asphalt, 10-year guarantee, $33,020; Central Bitulithic Company of Detroit, bitulithic, 10-year, $34,785; 5-year, $32,433; Barber Asphalt Paving Company, Detroit, bitulithic, 10-year, $32,666; Trinidad, 10-year, $32,500; Trinidad Lake asphalt, 10-year, $33,233; A. Prange, Grand Rapids, Canton brick, 10-year, $31,686; Dean & Connors, Albion, Mich., 10-year, $31,214; 5-year, $30,976.

Philadelphia, Pa.—Bids were received Dec. 17 for repairing streets, maintaining macadamized roads, etc., as follows: Repair streets, except asphalt and granolithic, Mack Paving Company, $144,200. Maintaining macadamized and improved roads, David Peoples, $175,000; Edward H. Vare, $122,000; David McMahon, $130,000; James R. Shanley, $170,000. For resurfacing macadamized roads with broken stone, David McMahon, 91 cents per square yard; Edward H. Vare, 80 cents; David Peoples, 95 cents, and James R. Shanley, 90 cents.

Syracuse, N. Y.—Bids have been submitted for paving S. Salina-st. as follows: John W. Bustin, 405 W. Onondaga-st., Syracuse brick, $22,370;, and sandstone between railway tracks, $24,690; C. H. Norton, Nelsonville block, $26,342, and sandstone between tracks, $28,118; Thomas Marnell, 228 W. Belden-st., Syracuse brick, $22,236, and sandstone between tracks, $24,864; John P. Baxter, jr., Syracuse brick, $23,558, and sandstone between tracks, $24,328; Central City Paving Company, Obispo asphalt, $24,871, and sandstone between tracks, $27,535; Syracuse Improvement Company, 1 Warner building, Trinidad asphalt, $22,302, and

sandstone between tracks, $26,003; Empire Contracting Company, 112 E. Jefferson-st., Trinidad asphalt, $23,921, and sandstone between tracks, $27,177.

SEWERS.

Columbus, O.—Mayor Jeffrey is opposed to the expenditure of $50,000 for the construction of a temporary or experimental sewage disposal plant.

CONTEMPLATED WORK.

Evansville, Ind.—A main sewer is contemplated.

Marden Rock, Wis.—Plans for a sewer are under consideration.

Chambersburg, Pa.—A 24-in. pipe sewer to the creek is proposed.

Croton, Conn.—The question of sewage disposal is being discussed.

Hutchinson, Kas.—The extension of the sewerage system is contemplated.

Fairview, Mich.—This village voted to issue bonds for building sewers.

Lambertsville, N. J.—The construction of a system of sewers is contemplated.

Menasha, Wis.—A sewer in Manitowoc-st. is contemplated. S. S. Little, cy. clk.

Rockford, Ill.—The city engineer is preparing plans for a new sewer in Prairie-st.

Red Wing, Minn.—Plans have been decided upon for a sewerage system in East Red Wing.

Ft. Wayne, Ind.—A resolution has been adopted for a system of sewers in South Wayne territory.

Houlton, Me.—An engineer will be engaged to make a survey for the extension of the sewerage system.

Fitchburg, Mass.—Plans have been prepared for building a sewerage system. David A. Hartwell, cy engr.

Belleville, Ill.—An ordinance has been adopted to build intercepting sewers and a septic tank. Mayor Kern.

Edwardsville, Ill.—Bids may be asked in February for constructing 20 to 30-in. pipe sewers and a septic tank.

Hagerstown, Md.—Mayor Holzappel, jr., advocates the construction of eight to ten underground drains to cost about $8,000.

Baltimore, Md.—The sewerage commission has finally placed the cost of the proposed sewerage system at $12,000,000.

Grand Rapids, Mich.—Estimates have been prepared for building sewers in Baldwin and N. Union-sts. and Ellsworth and Morris-aves.

Binghamton, N. Y.—S. E. Monroe, cy. engr., estimates the cost of the proposed Fourth Ward trunk sewer at $85,000 without the laterals.

Marion, Ind.—Contracts will be let soon for building storm water sewers in Harmon, Fortieth and Landes-sts. C. G. Robbins, cy. clk.

New York City.—A sewer is contemplated in Heath-ave., Morrisania district. A petition has been approved for a sewer in Victor-place.

Bridgeport, Conn.—An appropriation will be asked for the construction of a trunk sewer in Noble-ave. and the extension of the trunk sewer in Main-st.

Niagara Falls, N. Y.—A sewer is proposed from the disposal works in Echota to the tunnel trunk sewer. Bids will be asked for building a sewer in Beech-ave.

Buffalo, N. Y.—The Business Men and Taxpayers' Association of West Seneca has appointed a committee to report on the matter of installing a modern sewerage system.

Janesville, Wis.—The special committee has recommended the construction of sewers and storm sewers in a large number of streets on the west side of the river.

Johnstown, Pa.—Resolutions have been introduced providing for a trunk sewer to take care of the first, second and third ward sewage and for a permanent sewerage system.

Sebring, O.—Plans have been accepted for the proposed sewerage system. Plans and specifications for a new sewage disposal plant will be submitted to the State Board of Health.

Hyattsville, Md.—A preliminary survey of the town is being made by T. Chalkley Hatton of Wilmington, Del., preparatory to making estimates of the cost of installing a sewerage system.

The construction of sewerage systems is contemplated at the following places: Coldwater, Mich.; Saxonville, Mass.; Lakeville, Conn.; Newton, N. J.; Bennettsville, S. C.; Louisiana, Mo.; Santiago, Chili.

CONTRACTS TO BE LET.

Clinton, Ia.—Bids are asked until Jan. 12 for 5360 ft. of brick sewer. H. E. Oates, clk.

Crookston, Minn.—Bids are asked until Jan. 8 for constructing ditch No. 49. N. A. Hoffard, co. audt.

Cannelton, Ind.—Bids are asked until 10 a. m. Jan. 4 for constructing a public ditch. Bd. co. comrs.

Alexandria, Minn.—Bids are asked until Jan 11 for constructing ditch No. 3. E. P. Wright, co. audt.

Vinita, Ind. Ter.—Bids are asked until Jan. 5 for building a sewerage system. F. J. Barrett, recorder.

Anderson, Ind.—Bids are asked until Jan. 2 for constructing 7 mls. of open ditch. Morton H. Downey, co. surv.

Decatur, Ind.—Sealed bids are asked until 7 p. m. Jan. 5 for a 10 in. tile sewer in Marshall-st. D. M. Hower, cy. clk.

St. Paul, Minn.—Bids are asked until 2 p. m., Jan. 4 for building a sewer on Fairfield-ave. from Wabash to Custer-sts. B. P. W.

Montpelier, Ind.—Bids are asked until 8 p. m. Jan. 19 for constructing a vitrified pipe sewer and 4 lateral sewers. Josia F. Jones, cy. clk.

Washington, D. C.—Sealed bids are asked until Jan. 15 for a sewerage system at the Uintah and Ouray schools. W. A. Jones, comr. Indian Affairs.

Hawkinsville, Ga.—Sealed bids are asked until Jan. 21 for furnished and laying 19,500 feet of 6 to 15-in. sewer pipe, 30 manholes and 10 flush tanks. T. J. Holder, cy. clk.

Omaha, Neb.—Bids are asked, according to press reports, for constructing the Saddle Creek sewer, from Hamilton to California-sts. and sewers in Lincoln-ave. and Thirteenth and Cass-sts.

New Orleans, La.—Sealed bids are asked until Feb. 2 for constructing 66 mls. of sewers and appurtenances, including 700 manholes and 500 flush tanks. F. S. Shields secy. sewerage and water bd.

CONTRACTS AWARDED.

Tacoma, Wash.—Carlson & Swanson secured the contract Dec. 15 for building sewers in dist. No. 23 for $2,925.

Wabash, Ind.—The contract for constructing a ditch 7 mls. long was awarded to A. M. Jones of Syracuse for $10,000.

Burlington, Ia.—The contract for building the Hawkeye sewer was awarded to the Burlington Const. Company for $20,000.

Oakland, Cal.—The contract for building a main outlet sewer was awarded to E. B. & A.L. Stone for $135,511.10.

Kansas City, Mo.—The contract for constructing a sewer in district 218 was awarded to W. C. Mullins for $204,812.83.

Salt Lake City, Utah—The contract for constructing sewers was awarded Dec. 12 to Jas. Kennedy & Co. of Fargo, N. D., for $18,801.

Easton, Pa.—The contract for building a sewer from Second-st. to the Delaware river was awarded to John McQuerney, city, for $2,516.

National Park, N. J.—The contract for constructing sewerage system was awarded Dec. 1 to H. A. Miller of Wilmington for $5,387.54.

Steubenville, O.—John O. Bates was awarded the contract for building a 20-in. sewer on S. Seventh-st., from South to Slack-sts., for $1,488.80.

Greensboro, N. C.—The contract for building 13½ mls. of lateral sewers was awarded to Guild & Co. of Chattanooga, Tenn., for $34,529.

Harrisburg, Pa.—Henry Opperman was the lowest bidder, Dec. 19, for constructing the Second-st. sewer extension from Muench to Kelker for $671.

Saginaw, Mich.—Sewer contracts have been awarded as follows: State-st., from Merchon to Bay-sts., Z. & J. Lalonde; Mackinaw-st., from Center to Linden-sts., B. F. Brucker & Co.

Fremont, O.—Bids for building 1,100 ft. of sewer in State-st. were submitted as follows: $2,433; Kinney & Hughes, $2,271; A. Schekelhoff, $2,327; Myers & Gottron, $1,976; Jay Sullivan, $2,760.

Dayton, O.—Bids were submitted, Dec. 16, for constructing four sewers as follows: Wm. Hilt, $6,538; Robert J. Paul, $6,826; A. J. Meyer, $6,855; Jas. Reid, $6,674; John Munger, $6,462; Fred Goche, $3,685.

Philadelphia, Pa.—Bids were submitted, Dec. 17, for repairs to sewers as follows: Chas. D. Lamp, $17,450; Edw. H. Vare, $25,000; Wm. H. Achuff, $16,900; Jas. M. West, $14,400; B. E. Minaghan, $15,875; David Peoples, $29,000.

East Syracuse, N. Y.—The contract for building a sewerage system was awarded, Dec. 4, as follows: South Section, M. O'Hearn & Co., Pittsburg, $22,686.30; north section, De Nallo & Klingsburg of Kingston, $24,552.20.

Mishawka, Ind.—The Elkhart Construction Company was awarded the contract, Dec. 7, for building Joseph-st. sewer No. 3 for $1,430.68. Fred Rankert was awarded the contract for the Calhoun, Charlotte and Joseph-st. trunk sewer for $22,539.96.

Guttenberg, N. J.—Bids for building the main outlet sewer have been submitted as follows: George Horung, $33,669; Robert J. Emmer, $37,338; Palisade Construction Company, Jersey City, $40,998.72; August Theit, $36,902; Capone & Frost, $35,-022; Michael J. Curley, Jersey City, $40,-267.

Milwaukee, Wis.—The contract for completing the Kinnickinnic river flushing tunnel was awarded Dec. 22 to R. J. Hickey at $38 a lin. ft. R. W. Forrestal, who had the contract for the complete work and was released from the contract, had completed all but 385 feet of the work.

St. Paul, Minn.—Edward J. Kirkland submitted the lowest bid Dec. 14 for constructing the first three-fourths mile of the St. Anthony Park sewer system. His bid aggregated $59,122, which was $500 less than the city engineer's estimate. The sewer will be built of brick and stone or concrete and steel.

Centralia, Ill.—The contract for constructing a sewerage system was awarded Dec. 10 to Engel & Carpenter of West Pullman, Chicago, for $38,283.18. The work consists of 23,920 ft. 8 in., 10,165 ft. 10 in., 7,205 ft. 12 in., 1,880 ft. 15 in. and 3,575 ft. 18 in. pipe sewers, 75 manholes and 21 flush tanks. Iowa Engineering Company, Clinton, Ia., Engrs. in charge.

WATER-WORKS.

Chicago, Ill.—George Mayer was appointed receiver of the East Chicago Water Works Company, Dec. 8, by Judge Kavanaugh.

Columbia, Mo.—The city council decided, Dec. 16, to purchase the water and light plant of the Columbia Water and Light Company.

Camden, N. J.—The Wilmington Water and Light Company has been incorporated here, to supply water, by A. A. Holbrook, Geo. H. B. Martin and Joseph Cotter.

Kingston, N. Y.—The Supreme Court gave judgment, Dec. 6, in favor of the Orange County Trust Company as trustee of the Castleton Water Supply Company in its suit to foreclose a mortgage for $60,000 on the property of the Castleton Water Company.

Baltimore, Md.—W. Cabell Bruce, city solicitor, has commenced a crusade against the pollution of the water sheds

of the city's water supply. The water department has knowledge of about 500 cases of pollution, about 150 of which are technical, but not actual, inasmuch as they are within the limit set by law prohibiting the existence of nuisances near streams tributary to the water supply, and yet do not drain into the streams. Of the remaining number many consist of barnyards and pig pens and about 100 nuisances, all due to dwellings.

Indianapolis, Ind.—Suit was brought in the Federal court Dec. 17 by Frank H. Cooper of New York City, asking for a receiver for the Lake City Water Company, at Hammond, Ind., and asking for an injunction against that city to prevent it from cutting the company's connection with the city's mains. He claims that the city owes the company $15,000 for water rentals and is arranging to cut off the company's mains and supply citizens with water from other sources. Mr. Cooper is owner of 50 bonds of an issue of $197,000 authorized by the city of Hammond in 1901 to build a water works system.

Bristol, Tenn.—A temporary injunction restraining this city from putting into effect the deal by which the city was to become owner of the water works of the Bristol-Goodson Water Company, the King and Preston Springs, was granted by Chancellor H. H. Haynes, Dec. 12. The city had closed deal for these properties at $112,500. The citizens seeking the injunction, stated in their petition to the court that the city has no legal right to purchase and operate the plant of another corporation; that the city has no right to contract for rights-of-way and to construct a pipe line in Virginia which would be necessary to reach the Preston Springs, the proposed source of supply; that the price agreed upon is exorbitant. The petitioners propose the purchase of the Bristol-Goodson water works at a lower price, and the construction of a pipe line to the Holston River at Damascus, a distance of 15 miles.

CONTEMPLATED WORK.

Newton, N. J.—A storage reservoir is proposed.

Springfield, O. — The extension of the water mains is proposed.

Marquette, Mich.—The extension of the intake pipe is proposed.

Waldron, Ind.—A company has been organized to build a water works.

Fairview, Mich.—The village voted to issue bonds for water mains.

Auburn, N. Y.—The Water Board has decided to lay about 5 mis. of water mains during 1904.

Lancaster, Pa.—A committee has been appointed to investigate and report on a filtration plant.

Sheboygan, Wis.—Plans are being made for municipal water works. George C. Morgan, Chicago, engr.

Harrisburg, Pa.—The contract for constructing the filter plant will probably be let in February.

Waltham, Mass. — The improvement of the water supply will be taken up by the new city government.

Downers Grove, Ill.—The water mains will be extended on Rogers and Elm-sts. and Prairie-ave.

The question of issuing water works bonds will be voted on at the following places: Waverly, Minn.; Caro, Mich.

Pueblo, Colo.—An ordinance has been passed providing for the issue of $150,000 bonds for the North Side water works.

Gadsden, Ala.—The question of the city owning and operating its own water works system will be voted on Jan. 4.

Houghton, Mich. (Special)—W. V. Savicki, vil. engr., says this village contemplates enlarging its water works system.

Rockford, Ill.—A revolution was passed Dec. 7 favoring the installation of water meters in many of the large buildings.

Nevada, Mo. (Special)—James M. Clack, cy. engr., says this city voted to issue $90,000 for a new municipal water plant.

The question of issuing water works bonds has been favorably voted on as follows: Cedar Bluffs, Neb.; Saugatuck, Mich.; Phoenix, Ariz.

Sayville, N. Y.—The establishment of water works is contemplated by the Sayville Electric Light Company in connection with its electric plant.

Shenandoah, Pa.—The question of increasing the borough debt $50,000 for securing a more plentiful water supply will be voted on in February.

Yankton, S. D.—The estimated cost of improving the water works system including a standpipe, filtration plant and new mains is $77,000.

Columbus, Ga.—J. L. Ludlow, cons. engr., Winston, N. C., has submitted estimate of the cost of water works for this city. T. E. Golden, chmn. water comrs.

Brockton, Mass.—An ordinance has been passed providing for a loan of $150,000 for completing the Silver Lake Water Supply system. Horace Kingman, supt. w. w.

Springfield, Mass.—Mayor Stone and the Board of Water Commissioners have petitioned the legislature for authority to secure a water supply from the Westfield river.

Wheeling, W. Va.—This city has authorized an expenditure of $75,000 for a new 30-in. supply main from the pumping station to the reservoir. C. B. Cooke, cy. engr.

Philadelphia, Pa.—The loan bill providing for a bond issue of $16,000,000 for filtration, sewers, bridges, paving, building, etc., has been passed over the mayor's veto.

Delphi, Ind.—Cy. engr. Shields recommends the plan of taking water from the mill race on Deer Creek and filtering it, as a means of securing an increased water supply.

La Crosse, Wis.—A plan has been

formulated subject to the approval of the citizens, for the immediate construction of a filtration plant at a cost of $80,000 to $100,000.

Trenton, N. J.—The council finance committee contemplates employing an engineer to report upon the feasibility of auxiliary high pressure water mains for the center of this city.

Chehalis, Wash.—This city has purchased the plant of the Chehalis Water Company. A gravity water system and the improvement of the source of supply is now proposed. Francis Donahue, mayor.

The construction of water works systems is contemplated at the following places: Elberton, Ga.; Tahlequah, Ind. Ter.; Milo, Me.; Prospect, N. Y.; Garfield, N. J.; Winchester, Ill.; Murray, O.; Onawa, Ia.

CONTRACTS TO BE LET.

Hawkinsville, Ga.—Sealed bids are asked until Jan. 21 for a water works system. T. J. Holden, cy. clk.

New Orleans, La.—Sealed bids are asked until Feb. 2 for laying 2.7 mis. of water mains. F. S. Shields, secy. sewerage and water bd.

Ithaca, N. Y.—Bids are asked until Jan. 4 for constructing artesian wells to intake well at the pumping station. John Miller, secy. water bd.

Portland, Me.—Bids are asked until Jan. 22 for constructing a pumping and storage plant at Ft. McKinley, Me. Capt. A. W. Gates, Q. M. U. S. A.

San Antonio, Tex.—Bids are asked until Jan. 5 for the erection of a 50,000-gal. steel tank on 50 ft. trestle at Ft. Brown, Tex., T. E. True, C. Q. M.

Washington, D. C.—Sealed bids are asked until Jan. 7 for constructing a water tank and tower at the Mt. Pleasant School, Mich. W. A. Jones, comr. Indian Affairs.

Dayton, O.—Sealed bids are asked until Jan. 20 for furnishing and delivering 800 5/8-in., 20 3/4-in., 15 1-in., 5 1½-in. and 5 2-in. water meters. Louis Haas, prest. B. P. L.

Milwaukee, Wis.—Sealed bids are asked until Feb. 1 for furnishing a pumping engine, boilers and auxiliary machinery for the Kinnickinnic river flushing tunnel. Chas. J. Poetsch, chmn. comrs. pub. wks.

Prophetstown, Ill.—Bids will be received Jan. 19 for a steel tower and tank, two miles of mains, pumping station, gasoline engine, and triplex pump. Iowa Engineering Company, engrs., Clinton, Ia.

Minneapolis, Minn.—Bids are asked until Jan. 8 for furnishing 815 tons of 6, 8, 12 and 16-in. c. i. pipe; 64 6-in.; 3 8-in. and 4 12-in. valves; 103 hydrants; 25 tons special casting. L. A. Lyrard, cy. clk.; Andrew Rinker, cy. engr.

St. Paul, Minn.—Bids are asked until Jan. 11 for furnishing 4 to 16-in. water gates; 10,000 ft. 6-in., 4,000 ft. 12-in., 7,200 ft. 16-in. water pipe with privilege of additional pipe hydrants; 1,000 stop boxes; 4 to 16-in. valve boxes; cast iron specials. John Caulfield, secy. water comrs.

Washington, D. C.—Sealed bids are asked until Jan. 7 for constructing 18 mis. of canal, pressure pipes and tunnels, together with headworks, spillways and gates for the diversion and conduction of about 200 cu. ft. of water per second from Salt river, about 25 mis. north of Globe, Ariz., for power purposes. E. A. Hitchcock, secy. int.

CONTRACTS AWARDED.

Chickasha, Ind. Ter.—The contract for building the waterworks system was awarded to Burns & McDonnel of Kansas City.

Seattle, Wash.—The Pacific Coast Pipe Company was awarded the contract Dec. 5 for 8-in. banded wooden pipe with iron couplings for $66,792.

Regina, N. W. T.—The contract for a new waterworks system was awarded to Dobson, Jackson & Fry.

Clinton, Mass.—The contract for constructing the south dike of the Wachusett reservoir was awarded to Nawn & Brock of Boston for $128,015.

Riverside, Cal.—The contract for constructing water mains in 14th-st., 47th-ave., 13th-st. and 13th-place was awarded to James J. Lynch for $2,628.40.

Newark, N. J.—The Board of Works adopted the water contract Dec. 17 presented by the Borough Council of East Newark for a term of five years at $60 per 1,000,000 gallons.

Salt Lake City, Utah.—The contract for water mains extension was awarded Dec. 12 to James Kennedy & Company of Fargo, N. D., for $24,486.

National Park, N. J.—The contract for constructing a water works plant was awarded, Dec. 2, to H. A. Miller of Wilmington, Del., for $4,134.60.

Aurora, Neb.—The contract for a new boiler and pumping machinery for the water works was awarded to Joseph Burns of Lincoln, Neb., for $5,288.

Helena, Mont.—The contract for building a municipal water works system was awarded, Dec. 14, to the Congress Construction Company of Chicago for $579,000. The bids were opened Nov. 25.

Blasdell, N. Y.—Special)—The contract for 492 tons of 4 and 6-in. c. i. pipe and 7½ tons of special castings was awarded to Wm. V. Briggs of New York City for $13,851; valves, hydrants and gate boxes, Eddy Valve Company, $2,300.

Marshalltown, Ia.—Contracts for the improvement of the water supply were awarded, Dec. 4, as follows: Constructing reservoir and pumping well and laying connecting pipe, Elzy & Dunn of Marshalltown, $17,200; c. i. pipe, U. S. Cast Iron Pipe & Foundry Company, Chicago, $26.25 per ton; valves, Rensselaer Mfg. Company, Troy, N. Y.

BRIDGES.

Morrisville, N. J.—A new bridge over the canal at Bridge-st. is proposed.

Carlisle, Ind.—The construction of an iron bridge in the city is contemplated by the co. comrs.

Utica, N. Y.—The estimated cost of rebuilding Schuyler-st. bridge over Mohawk river is $7,000.

Midland, Mich.—Bids are asked until Jan. 4 for repairing upper bridge. H. D. Holden, clk. B. P. W.

Walpole, N. H.—A bridge over Connecticut river at North Walpole is contemplated by the selectmen.

Manitowoc, Wis.—Plans for a new foot bridge across the Manitowoc river have been submitted to council.

Rensselaer, N. Y.—The question of a bridge over Hudson river north of Livingston-ave. is being agitated.

Creston, La.—Bids are asked until Jan. 4 for all bridges to be built during 1904. Geo. Brotherton, co. audt.

Grand Rapids, Mich.—Bids will be asked in January for the Wealthy-ave. bridge. L. W. Anderson, cy. engr.

Stockport, N. Y.—This town voted Dec. 15 to appropriate $3,500 for building a foot bridge over Kinderhook creek.

Little Falls, N. Y.—The construction of a bridge across the creek in E. Mill-st. is contemplated. Cy. Engr. Lansing.

Portland, Ore.—Plans have been completed for a steel bridge across Balch Gulch at Thurman-st. Cy. Engr. Elliott.

Hastings, Neb.—Sealed bids are asked until 9 a. m. Jan. 4 for building bridges in Adams County. W. H. Davis, co. clk.

Wayne, Neb.—Bids are asked until Jan. 12 for building and repairing county bridges during 1904. Bert Brown, co. clk.

Chicago, Ill.—A bridge over the south fork of the south branch of the Chicago river at Thirty-first-st. is proposed during 1904.

Redding, Cal.—Bids will be asked at once for building a brick bridge across Calaboose creek at Yuba-st. Cy. Engr. Burson.

Dallas, Tex.—The City Council contemplates establishing a system of permanent bridges to be built of masonry and steel.

Centerville, Md.—Bids are asked until Jan. 12 for building a steel drawbridge over Kent Island Narrows. Joseph M. Parvis, clk.

Central Falls, R. I.—This city has appropriated $22,500 as its share of the bridge to be erected at Cross-st. jointly with Pawtucket.

Saginaw, Mich.—This city will apply to the county board of supervisors Jan. 11 for authority to construct a highway bridge across Saginaw river.

Bridgeport, Conn.—The joint construction of a concrete bridge over Ash creek is contemplated by this city and Fairfield. H. G. Schofield, cy. engr.

Colville, Wash.—Bids are asked until Jan. 4 for building a Howe truss bridge over Kettle River at station of Barstow, 8 mis. north of Marcus. Co. comrs.

Davenport, Wash.—Bids are asked until Jan. 4 for building a combination wagon bridge over Spokane river, near the town of Reardon. A. S. Brown, co. audt.

Hempstead, L. I.—The town board passed a resolution Dec. 14 to build an iron bridge over a creek on the Mill road, south of the village of Freeport.

Olivia, Minn.—Sealed bids are asked until Jan. 5 for building a steel bridge across the Minnesota River, near the village of Franklin. H. J. Lee, co. audt.

Streator, Ill.—The council has adopted plans for the proposed Marie-st. bridge. The plans provide for a steel bridge on concrete abutments and piers.

San. José, Cal.—Sealed bids are asked until 10 a. m. Jan 5 for a concrete bridge over Calabasas Creek on the Stevens Creek road. Henry A. Pfister, co. clk.

Rushville, Ind.—The contract for building a joint arch bridge between Fayette and Rush Counties was awarded to the National Bridge Company of Indianapolis for $1,040.

Eudora, Kas.—Bids are asked until Jan. 5 for a bridge over Kansas river at this place. Geo. A. Flory, clk. joint bd. comrs. Douglas and Leavenworth Cos. at Lawrence.

Boston, Mass.—Sealed bids are asked until 12 m. Jan. 16 for building the steel superstructure for Cambridge bridge. Patrick A. Collins, chmn. Cambridge Bridge Comn., City Hall, Boston.

Chicago, Ill.—Sealed bids are asked until Jan. 27 for constructing the substructure and superstructure of a bride across the Chicago river. Thos. A. Smyth, prest. bd. trustees sanitary dist.

Stroudsburg, Pa.—Bids are asked until Jan. 14 for rebuilding substructure and superstructure of a bridge over Broadheads creek. John E. Scott, secy. com. on bldgs. and grounds, Harrisburg.

Charlotte, N. Y.—The committee appointed to investigate the matter of building a bridge across Genesee river has reported to the board of supvrs. recommending the Bridge Road site. The county engineer has been directed to prepare plans.

Toledo, O.—Bids are asked until Jan. 20 for building abutments and approaches to the bridge in Keener road, Wonclora twp., and at Strickney-ave., Washington twp.; building a 40-ft. bridge over Cedar creek, in Jerusalem twp.; bridge and abutments on Lecor-ave., Washington twp. David T. David, jr., co. audt.

Los Angeles, Cal.—Bids are asked until Jan. 5 for constructing the Fourth-st. bridge, consisting of 8 spans, combination wood and steel, supported by steel towers and concrete-steel cylinders; Macy-st. bridge, combination wood and steel supported by concrete steel cylinders and concrete abutments. H. F. Stafford, cy. engr.

Dayton, O.—(Special)—F. M. Turner, cy. engr., says bids were submitted Dec. 22 for constructing a concrete steel arch bridge across the Great Miami river at Third-st. as follows: Charles Hoglen, Dayton, $179,000; Moore-Mansfield Constr. Company, Indianapolis, two bids, $192,870 and $196,070; J. O. Shoup, Dayton, $202,000; W. T. Gawne Company, Cleveland, $204,797; Adams Bros., Zanesville, $212,000; The Ferro Concrete Constr. Company,

Cincinnati, $213,500; R. L. Fosburgh & Sons, Boston, $214,000; King Bridge Company, Cleveland, $219,500. T. A. Gillespie Company, Pittsburg, $220,000; G. H. Fath & Son Constr. Company, Cleveland, $247,-861; H. E. Talbott & Co., Dayton, $248,-640; M. Rabbitt & Sons Company, Toledo, $340,000.

PARKS.

Syracuse, N. Y.—The purchase of Kirk Park for public park purposes is proproposed.

Bangor, Me. — A proposition is being considered by this city providing for making Maplewood Park public.

Atlantic City, N. J.—An ordinance has passed second reading providing for the purchase of several squares of property in the Gardner tract for a public park.

STREET LIGHTING.

Glastonbury, Conn. — A new electric power plant is proposed.

Waverly, Minn.—The question of issuing bonds for an electric light plant will be voted on.

Dallas, Tex.—The question of a municipal light and power plant for this city is being agitated.

Beloit, Wis.—Plans have been prepared for a new municipal electric light plant. Robert, Caldwell, cy. engr.

Mechanicsburg, O.—The Mechanicsburg Light and Power Company contemplates the construction of an electric light plant.

Girard, Kas.—Plans and specifications have been adopted for an electric light plant. J. B. Grantham, cy. clk.

Buffalo, N. Y.—The trustees of the city and county hall have asked the county supervisors to install an electric light plant.

Kewanee, Ill.—The city council abandoned Dec. 23 the proposed plan of building and operating a municipal electric lighting plant.

Irvington, N. J.—The fire and water com. was directed Dec. 22 to solicit estimates on the probable cost of a municipal lighting plant.

Hancock, Mich.—A three-year contract has been awarded the Houghton County Electric Light Company to furnish street lights at $68 per lamp per year.

St. Paul, Minn.—The contract for street lighting during 1904 was awarded to the Cleveland Vapor Light Company, Cleveland, O., at $23.36 per lamp.

Denver, Colo.—Sealed bids are asked until 11 a. m. Jan. 14 for installing an electric light plant at Ft. Logan, Colo. J. W. Page, cn. Q. M.

Electric light plants are contemplated at the following prices: Gettysburg, Pa.; East Helena, Mont.; Livingston, Mont.; Joplin, Mo.; Rosalia, Wash.; Downey, Cal.

Yankton, S. D.—John J. Flatcher, who was engaged to examine the electric light plant which the city contemplates purchasing, reports that the value of the plant is $14,755.

Jeffersonville, Ind.—The suit of the United Gas and Electric Company against this city, involving the lighting contract, will be settled by compromise, according to press reports.

Addington, Pa.—The citizens of this town, Kershaw's Bank, Garrettford and Fernwood, and the towns in Upper Darby twp, are considering the question of street lighting for the entire township.

Bay City, Mich.—A resolution was adopted Dec. 21, directing city attorney Orr to prepare an ordinance empowering this city to engage in commercial lighting and furnish heat and power supply from electrical sources.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Calgary, Alberta—(Special)—This city desires to correspond with makers or builders of garbage crematories. F. W. Thorold, cy. engr.

St. Louis, Mo.—David R. Francis, prest. Louisiana Purchase Exposition, has authorized the erection of a garbage and light plant on the World's Fair grounds.

Charleston, W. Va.—The contract for erecting a crematory was awarded Dec. 17 to the Public Utilities Company, 15 William-st., New York City for $8,077 for a twenty-ton incinerator.

Harrisburg, Pa.—The sanitary committee approved Dec. 14, specifications for garbage collection, and bids will be received Jan. 7 for collecting garbage for periods of one to ten years.

Philadelphia, Pa.—Mayor Weaver is reported as considering a proposition made by John Pessano & Co. who offer to erect a garbage crematory for $1,500,000 if a thirty-year contract is given them.

New York City—Bids for the removal of snow and ice in Boro of Bronx were received Dec. 22 as follows: Rawling & Farley, 19 cents a cubic yard; William Bradley, 16 cents.; Thomas Crummins, 20 cents; Holland Bros., 21 cents.

Jersey City, N. J.—The contract for street cleaning and garbage removal for the fiscal year beginning Dec. 1 was awarded to Henry Byrne as follows: Sweeping about 2,950 stone-paved streets, $9.90 per lin. mile; sweeping about 2,300 miles of asphalt paved streets, $3.96 per mile; sweeping about 100 miles of macadam paved streets, $8.91 per mile; in gross, for removing ashes and garbage during the year, $24,750; for each man detailed to gather up waste paper, per day, $2.47.